TELEPHONE ENGINEER

VOLUME XXV SEPTEMBER, 1921 Number 3

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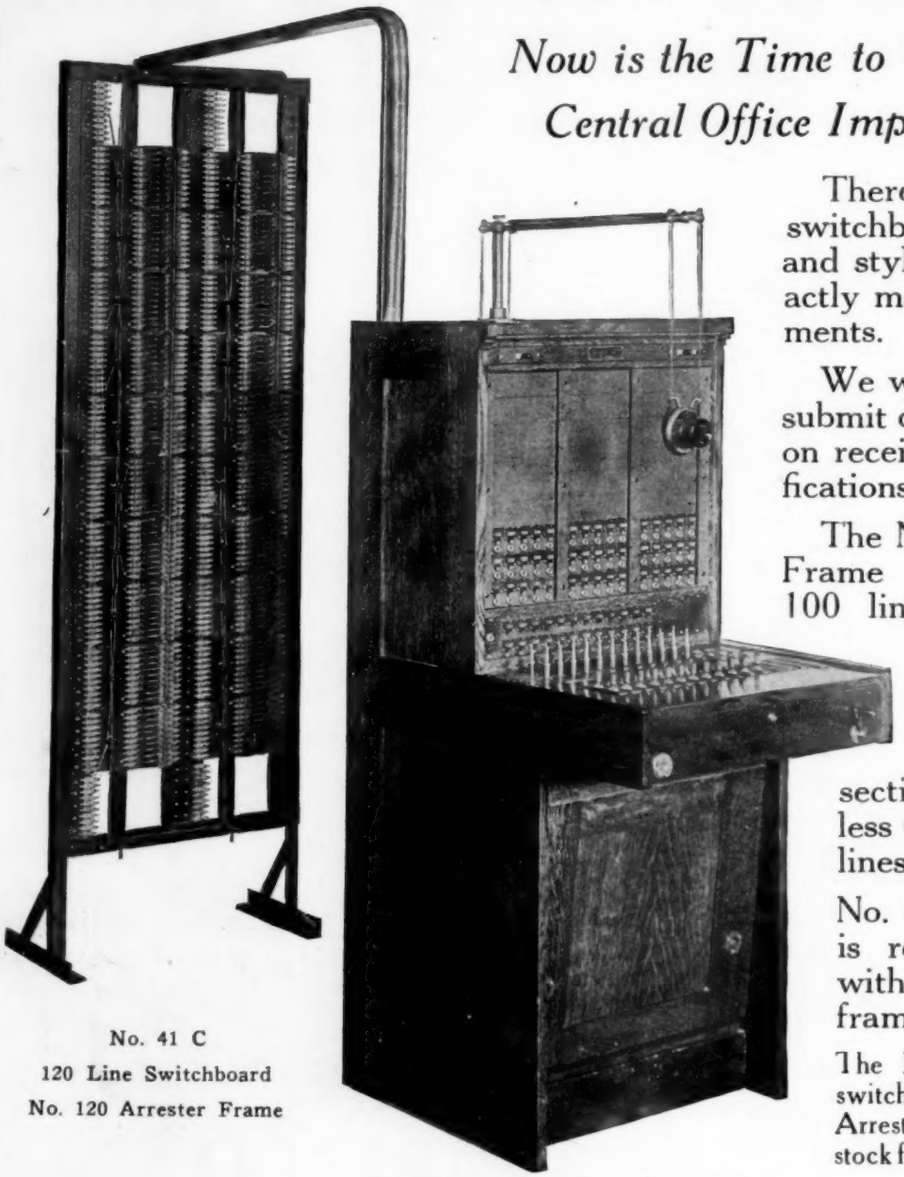

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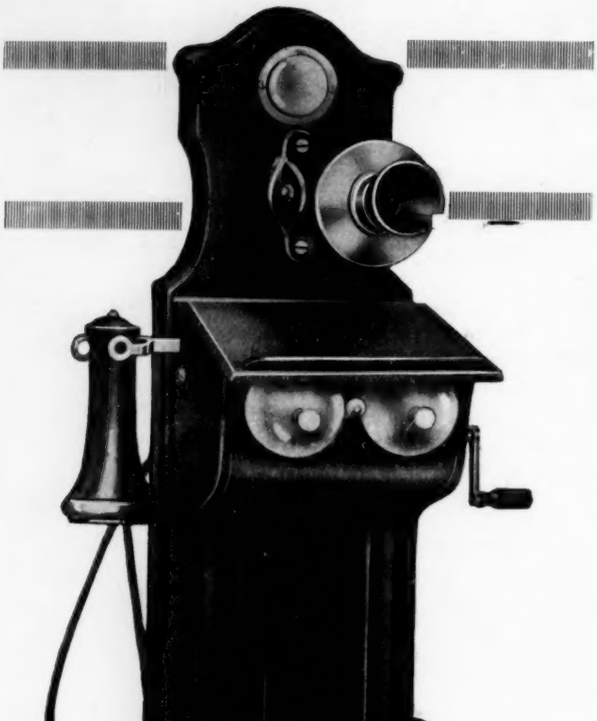

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Determining Utility Value

Prominent Telephone Engineer Discusses Factors in Establishing the Correct Values of Telephone Properties—Cites Authoritative Statements

By J. K. Johnston

It is the problem of an engineer to ascertain what amount of money would constitute a full and perfect equivalent of the property which the company is using in the service of the public. This value cannot be fixed arbitrarily, but must be deduced from all the pertinent facts. It will be noted that the law does not limit the ascertainment of value to the bare physical property. All the property, the complete property, includes more than the physical parts. The company has a business which it has cost money to establish and it is obvious that the physical property is only a part of the company's complete and going telephone plant and business.

My finding has been prepared in the belief that the Company's property, although devoted to a public use, is private property, possessing all the elements of value that private property can possess; and in reliance upon the decisions of the Supreme Court of the United States that this is true. My aim has been to do the same as the valuation division of the Interstate Commerce commission does in valuing the property of common carriers under its jurisdiction, namely: "Measure every fact obtainable" of the property and of the company, so that, "from the just consideration of all these facts" the commission may "determine the fair value of the property as of today." That the commission in determining the value of the property, must be guided and controlled by the economic rules which govern and control the commercial world of today in valuing property devoted to commercial purposes. A fair and just result can not be achieved by the employment of mathematical formulae or artificial rules, or by the application of percentage the sufficiency of which has been determined arbitrarily, or upon facts or under conditions different from those herein presented.

In Accord With Usage

If the method by which regulative body reaches its conclusion as to the value of the property be different from that employed by those engaged in the commerce of the country; if regulative body rejects certain factors and includes others not considered by the man in the street; if their methods or conclusion be not in accordance with the accepted economics as known today, then the conclusion can not be sound. The established public usage determines what are the factors actually affecting value, and a finding contrary to such usages is not a determination of value, but states undefined something different from value, unauthorized by law, and wholly unreliable as a basis for sound business conclusions upon the ultimate question of rates.

The decisions of courts and commissions have not undertaken to state specifically all of the elements which are to be considered in determining the value of a piece of property.

In the Monongahela River and Navigation Case, 148 U. S. 312, the Supreme Court of the United States held that Congress had not the power to state what factors should be taken into account in determining the value of the property in question, the Court saying:

"By this legislation Congress seems to have assumed the right to determine what shall be the measure of compensation. But this is a judicial and not a legislative question. It does not rest with the public taking the property, through Congress or Legislature, its representatives, to say what compensation shall be paid or even what shall be the rule of compensation. The constitution has declared that just compensation shall be paid and the ascertainment of that is a judicial inquiry."

Mr. Johnston has made some references as to the comment of Commissioner Forward of the Virginia State Corporation Commission. He also used the Albemarle Telephone company of Charlottesville, Virginia, in answer to the commissioner's argument as to going value.

The reason he makes these citations is, because in this particular case rates were refused, due to the fact, it is said, that the case was not properly presented by the company's local attorney. This has been the mistake in the past in a great many rate cases, as the matter has been left largely in the hands of a local attorney who does not know anything about the telephone business.

While he does not want to convey the idea that he is opposed to an attorney handling rate cases, which he is not, he does claim that before an attorney takes a case he should familiarize himself in telephone matters. Few attorneys are familiar with the utility law and court decisions relative to values.

It is a fact that what the company is justly entitled to, is to earn, a fair return on the reasonable value of the property. Therefore, the whole matter hinges upon, what is the reasonable value of a utility property, which Mr. Johnston has tried to show in the article.—*The Editors.*

Factors in Valuation

No practical man in valuing the property of a telephone company would limit himself to the mere physical property. The practical man would consider the property with all its characteristics, including its established business, its organization and its capacity, or power to earn money. He would not stop with the value of the physical property, because that property would be without value, relatively speaking, until it has a business attached to it and an organization to operate it and to earn money by such operation.

The full present value is what regulative body must determine. This rule is declared by many decisions of the Supreme Court of the United States and, is that value which may not be impaired by inadequate or confiscatory rates.

Willcox v. Consolidated Gas company, 212 U. S. 41 on page 52 it said:

"And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property which legally enters into the consideration of the question of rates has increased in value since it was acquired, the company is entitled to the benefit of such increase."

In San Diego Land & Town company v. Jasper, 189 U. S. 439, a rate case, the Court said:

"It no longer is open to dispute that under the Constitution what the company is entitled to demand, in order that it may have just compensation, is a fair return upon the reasonable value of the property at the time it is being used for the public."

Use Present Day Costs?

The question is whether or not original cost or reproduction cost as of the date in which the case is under review shall govern in proceedings to test the constitutionality of rate fixing laws or ordinances has been based upon by the Supreme Court of the United States many times. In each decision touching this question, the court has announced that value as of a date of the fixing of the rate is the correct basis for rate making. There has never been any deviation from this rule although time and again the court has had the original cost theory vigorously urged upon it.

In the San Diego Land & Town company vs. City of National City, 74 Fed.; 79; 83, the trial court used the following language:

"In the solution of that problem many considerations may enter; the amount of money actually invested. But that is by no means of itself, controlling, even where the property was at the time fairly worth what it cost. *If it has since enhanced in value, those who invested their money in it, like others who invested their money in any other kind of property, are justly entitled to the benefit of the increased values. If, on the other hand, the property has decreased in value, it is but right that those who invested their money in it, and took the chances of an increase in value, should bear the burden of the decrease.* In my judgment, it is the actual value of the property at the time the rates are to be fixed that should form the basis upon which to compute just rates."

In reviewing this decision, the Supreme Court said:

"What elements are involved in the general inquiry as to the reasonableness of rates established by law for the use of property by the public? * * * *What the company is entitled to demand, in order that it may have just compensation, is a fair return upon the reasonable value of the property at the time it is being used for the public. The property may have cost more than it ought to have cost, and its outstanding bonds for money borrowed and which went into the plant may be in excess of the real value of the property.*"

The following cases of courts and commissions confirms what has already been said:

Consolidated Gas company vs. City of New York, 157, Federal Reporter.

In the Minnesota Rate Case Shepard vs. Northern Pacific Ry. company, 184 Federal Reporter.

In the case of the City and County of Denver vs. Denver Union Water company, 246 U. S.

Cumberland Telephone company vs. City of Louisville, 187 Federal.

Louisville & Nashville Railroad company vs. Railroad Commission, 196 Federal.

Lincoln Gas & Electric Light company vs. City of Lincoln, 250 U. S.

Pittsburg Railway Company vs. Public Service Commission of the State of Missouri, et al., an action in the U. S. Court for an injunction against an order of the Public Service Commission of Missouri, denying an increase in passenger fares to the complainant before District Judges Wade and Circuit Judge Stone.

Supreme Court of Illinois in the case of Public Utilities Commission, appellant, vs. Springfield Gas & Electric Company.

City of Winona vs. Wisconsin-Minnesota Light & Power Company (March 1920) Judge Booth of the United States District Court of Minnesota.

Judge Van Valkenburgh of the United States District Court for the Western District of Missouri in the case of the St. Joe Railway Light, Heat and Power company, complainant, vs. Public Service commission of the State of Missouri, et al. In this case the Public Service commission of the State of Missouri adopted original cost as a rate basis. Judge Van Valkenburgh enjoined the commission from the enforcement of its order January 1920 based upon his findings said:

"It is my judgment that the great weight of authority is against the adoption of a standard of original cost as a controlling basis for determining present value. The present fair value is the subject to be attained. *Nor do I think it permissible to restrict the inquiry to a period antedating present cost prices.*"

Reproduction Cost As a Standard

Strong arguments can be made for the use of cost of reproduction as a standard of value for rate purposes. If it is a fact that what the public is entitled to, is service at a rate of charge sufficient only to pay a fair return on the investment that would be required at the present time to furnish this service; is it not a fact that the company is entitled to receive a fair return on the capital invested that it would have to expend at present in order to provide the service. Rates of charges measured on this basis corresponds to the present cost of service the present capital invested is the cost at this time of labor and material of the existing property devoted to the service of the public.

When an article to be valued is one of a class of substantially alike, frequently bought and sold upon the market, the price thus paid and accepted may fix what is called the "market value", so that little scope remains for the consideration of other facts. But where the property is of such a nature that it can have no market value, in the sense that such value is established by frequent sales, this measure can not be invoked, and resort must be had to other methods of procedure. One plan is to estimate the cost of reproducing the thing in question. Determining value by the "cost of reproduction" often has been accepted as purely a theoretical and fanciful practice. A little consideration, however, convinces me that it is precisely the course pursued by men in the conduct of their every day business affairs. Brown buys a vacant lot in the suburbs. He builds, plants and beautifies. Smith proposes to buy from Brown and in deciding the price he will pay, the most potent influence upon his mind is, not "What it has cost Brown?" but "What would it cost him to reproduce Brown's place?"

Cost of reproduction may mean the cost of substitute plant of the most modern approved design capable of performing the same service as the existing plant. If the old plant was

wiped out, what would it cost at the present time to construct a plant capable of performing the service now performed by the old plant.

There are a number of these conceptions of the cost of reproduction method; cost of reproduction may mean the cost of identical reproduction of the existing plant. This is the usual method. It does not mean, however, that apparatus of antique patterns will be exactly duplicated but that it will be assumed to be replaced by the nearest modern substitute. Likewise the most economical and equal serviceable material will generally be used; as in some cases, for example, automatic equipment will take the place of manual equipment.

We think the inquiry along the line of reproduction should, however, be limited to the replacing of the present system by one substantially like it. To compare a certain system with one more modern would be to open a wide door to speculative inquiry.

The general trend of supreme courts decision has been to make reproduction cost the sole or controlling basis of value for rate purposes. Some courts plainly state that in their opinion actual cost, capitalization and other factors are to be considered only to the extent that they may throw light on the cost of reproduction or existing depreciation.

In support of this position the following opinions of Supreme Courts of the United States and lower courts and also Public Service Commissions are cited:

In the case of Ames vs. U. P. Railway company to restrain by injunction from enforcing certain rates as prescribed by the Nebraska Legislature Justice Brewer of the U. S. Circuit Court says:

"It is doubtful whether any single rule can be laid down to suit all cases if it be said that the rates must be such as to secure to the owner a reasonable per cent on the money invested, it will be remembered that many things have happened to make the investment far in excess of the actual value of the property; poor engineering, rascality on the part of those engaged in the construction and management of the property, nevertheless the amount of money that has gone into the property, the actual investment as expressed is not to be ignored even though such sums be far in excess of the present value."

Oklahoma Supreme Court in the Pioneer Telephone case in which an appeal was taken by the telephone company to the Supreme Court of Oklahoma from an order of the commission directing the restoration of certain telephone rates which had been increased by the company, a valuation was made of the property and in reversing the commission's order Judge Hayes says:

"The basis of all calculations as to the reasonableness of the rates to be charged by the Public Service corporations is the fair value of the property used by the corporation in rendering the service to the public. The rate is fair when its application will yield a fair return upon the reasonable value of the property at the time it is being used for the public, it is unfair when it does not yield such returns, and the method most frequently used is to ascertain what it would cost to reproduce the plant or the cost of its replacements at the present time."

Connecticut Public Utility Commission rejects actual cost in favor of reproduction cost, in 1912. The commission says:

"We do not think that the original cost of construction whatever that may have been, the price paid for the line by the Connecticut Company, whether exorbitant or otherwise, or any inflated value for the issue of stocks or bonds, are proper standards to determine the value of the plant and equipment for rate purposes. The Company is entitled to receive a fair income, but that the actual cost of reproduction at the present time in this particular case is a more accurate standard and the one which the Commission has followed in determining such values."

The Council of the city of Lima vs. Lima Telephone & Telegraph company, under date of July 21, 1916, before the Utilities Commission of Ohio. Commission Langdon in his findings, says:

"We do not find in this record any evidence upon which to base and determine the actual cost incurred by the company in establishing its business. As stated, we think the solution of this question should therefore be upon the basis upon which we ascertain the value of the Company's physical property by the cost of reproduction."

The report of the St. Louis Public Service commission on rates for electric light and power, made on February 17, 1911, states that, in determining the cost of reproduction for rate purposes the commission has taken into consideration the actual conditions under which the property has been created. The commission says:

"As represented by the Company, the theory of cost of reproduction new means that the value upon which it should be permitted to earn a fair return should be the estimated cost of reproducing at the present time, the property as it now exists."

"The theory or rather method by which the commission has arrived at its final figures differs essentially from the theory of cost of reproduction new, as used by the Company, in that the Commission has taken into consideration the actual conditions under which the property has been created."

When a system is first established actual cost and cost of reproduction are the same; reasonable rates of charges would consequently be the same regardless of whether fair values were based upon actual cost or on cost of reproduction. Let us assume now that the original capital invested, or actual cost, remain the same for a period of ten years but in that period the cost of reproduction is constantly changing. In the first case assume that the price of material and labor decline, cost of reproduction has therefore, largely decreased, and on that basis rates of charges may be lower; but this is not giving the utility a square deal because it devoted a certain amount of money to a public use and is entitled to a fair return on the investment, provided the business can be made to earn it, as though it had actually loaned that amount of money to the public. On the other hand cost of reproduction instead of decreasing through no fault of the company, may increase in the same way as are the conditions at the present time, cost of reproduction has now enormously increased and on that basis the rates of charges must be greatly increased.

In the case of the Consolidated Gas company as referred to before the original cost doctrine was vigorously contended for by the city and District Judge Hough announced his views upon this question as follows:

"It appears by undisputed evidence that some of these last items of property cost more than new articles of the same kind would have cost at the time of the inquiry; that some are of designs not now favored by the scientific and manufacturing world; so that no one now entering upon a similar business would consider it wise to erect such machinery or obtain such apparatus. *In every instance, however, the value assigned to the report is what it would cost presently to reproduce such items of property in its present condition, and capable of giving service either better or worse than it now does.*"

I think it proper and wise to defend my methods of calculating existing physical depreciation as shown in my appraisal of August, 1918.

In the opinion of Commissioner Forward of the State Corporation commission of the Commonwealth of Virginia, in commenting upon the accrued depreciation as found in my appraisal of 1918 says:

"Careful and conscientious as Mr. Johnston undoubtedly is, we can not accept his method of calculating ac-

crued depreciation. Apparently, he formed his individual opinion after looking at the items of property. When so much of the value is invisible, this must necessarily be a faulty method."

I desire to urge here, that the only proper method in which to determine the actual per cent. condition of the property is by careful and judicial inspection of the property and not by application of life tables or theoretical depreciation. The error committed in attempting to arrive at the depreciated or present value of a plant by applying the rule of average or the life and age method is well illustrated in the case of In Re Tonopah & Tide Water Railway C. R. C. R. 205 decided by the California commission. In that case the reproduction value new as presented by the commission's engineering department differed from the company's engineers to the amount of $335,160 as to accrued depreciation. The commission's engineers had applied the rule of averages. The commission was not satisfied with the results reached by its own engineers and it stated on page 215

"At the hearing in this proceeding the railroad company complained that the engineering department's estimate of the present value was unfair to the company in many respects. The commission was not satisfied with the evidence presented on this question and accordingly directed its engineering department to make an inspection of the property and to pay particular attention to the present depreciated condition thereof. As a result of this inspection the engineering department has prepared a supplemental report on "present value" in which report it has increased its estimate of present value, to the amount of $124,079.00. * * * It is the commission's aim in all these cases to make findings which shall be fair and just as applied not to some average railroad but rather to the particular railroad which is the subject of the commission's investigations. Average unit prices and average percentages of depreciation are of very great value as a basis in this work; but they must be modified where the conditions are not average if this commission is to be fair to each particular railroad".

The error of using theoretical estimates also was pointed out in Willcox v. Consolidated Gas company, 212 U. S. 19; the master's report was approved. The master stated:

"Mr. Marks did not particularly regard the extent of depreciation actually existing, but assumed a theoretical deterioriation of the supposed life of the plant".

In the case of City of Helena v. Helena Light & Railway company, Public Service commission of Montana, Sixth Annual Report, Page 195, there is as follows:

"Whether or not the valuation thus obtained is subject to depreciation, and if so, to what extent, is a matter of expert opinion, depending upon the amount expended for maintenance, renewals and permanent improvement work; the period during which such amounts were expended and in general, the state of repair of the property. It will be obvious that there can be no fixed percentage of depreciation applicable to a utility that has been kept up from year to year by constant effort, and the purchase of improved devices, as compared with one that has been allowed to deteriorate through neglect, hence the principle of an arbitrarily established measure of depreciation is untenable."

It is not therefore clear that the factor of personal inspection instead of theoretical depreciation is the proper method by which to determine the percent condition of the plant. It necessarily follows that my figures for these items should be adopted until such time as it is proved that I am incorrect. Depreciation is a provable fact and is solely a matter of judgment.

Would anyone purchase a second-hand automobile, or any other piece of machinery or equipment by the use of life table method to determine the condition? Would it not be a wise and prudent man who would inspect the article to be purchased as to the present condition? Anyone familiar with the telephone business know that I speak the truth when I say: That there are in use today telephone switchboards that have only been in service five or six years and are practically worn out, due to deferred maintenance. On the other hand there are switchboards that have been in service fifteen or eighteen years and are in good class condition. Therefore, could anyone justly appropriate existing physical depreciation that would be applicable to these conditions, other than by personal inspection. It is the only method that will stand the test.

Against these facts and actual experience the Commission can not successfully weigh the estimate, guess or arbitrary assumption. No wrong can result from conclusions based upon facts and actual experience—injustice frequently results from guess work.

Going Value

Commissioner Forward in his opinion as to going value, stated: "As to going value, that elusive bird at which so many courts and commissions have shot, we think it best to compute instead a preliminary organization and development allowance of 2½%."

I can not agree with the Honorable Commissioner, as to avoiding explanation of going value, I will here attempt to elucidate going value.

The Albemarle Telephone company owns and is maintaining for the use of the public, the following property: land, buildings, switchboards, cables, conduits, poles, wires, station equipment and miscellaneous equipment of plant such as tools, furniture and supplies. These are what is ordinarily known as the bare bones, or the physical property. The company also has other property which is just as costly, just as valuable and just as necessary in furnishing a telephone service to the city of Charlottesville and territory adjacent.

It has records of the property and of the accounts.

It has proper routines issued to the employees by which uniform and efficient service is rendered.

It has adequate specifications for the employees as their guide for the proper and economical performance of their work.

It has subscribers; It has thousands of contracts: its thousands of accounts have been opened.

It has in Charlottesville an organization of employees trained and working harmoniously together, giving a satisfactory service to the public.

It has an organized, operating business. In addition to the bare physical plant, it has every item of value by which a live going plant exceeds in value a dead or dormant plant.

There is a cost in all this, and to create this operating organization and to get the subscribers, adds materially both to the cost and to the value of the property. Any one would pay more for a physical plant actually in operation with the organization and the subscribers already obtained, than they would for a bare or dormant plant. Starting with a bare physical plant, it would involve a large additional capital investment to reproduce the business, to convert the dead physical property into a live going concern.

A very important matter in establishing or reproducing, even a telephone business, is the failure to make normal earnings at the start. Experience in almost every kind of business shows that at the start there always is a period before the business is fully established and running smoothly and its customers collected, in which the enterprise runs behind the normal thereafter established. In addition to the study of telephone business, bankers and business men who have established branch stores of various kinds have been consulted and

their experience is that seldom do they pay expenses the first year of operation or pay a dividend the second year —their stores or banks run behind. These deficits they ordinarily anticipate in their financing program. Such deficits during development are also ordinarily experienced in establishing any sort of telephone enterprise.

Analysis of one element referred to —its efficiency to provide first-class and adequate service—would show the physical property practically worthless without the management or organization. The management or organization is powerless without the physical property. A telephone plant, constructed of standard material, equipment of the most modern type, with lines extended and connected, with 'phones installed in residence and business places, without an efficient organization and management, would fail utterly to fulfill the purpose for which it is constructed. Until that organization and management could be assembled and acquire a knowledge of the business and the wants of the people, the delivery of the service would be crippled, the conduct of the business hampered and delayed, and cause great loss until that knowledge had been acquired by the only teacher possible—time and experience.

All of the foregoing is included in what is herein called "Cost of Establishing Business". The Courts usually refer to this item of value as "Going Concern Value". In the Des Moines case, 238 U. S. 153, the Supreme Court of the United States, for instance said:

"Going Value" or 'going concern value', i. e. the value which inheres in a plant where its business is established, as distinguished from one which has yet to establish its business, has been the subject of much discussion in rate making cases before the Courts and Commissions * * *. That there is an element of value in an assembled and established plant, doing business and earning money, over one not thus advanced is self evident. The element of value is a property right, and should be considered in determining the value of the property, upon which the owner has a right to make a fair return."

A reliable and conservative study and estimate of what is would cost to reproduce this part of the property has been made. It has been ascertained as accurately as is possible what it would actually cost to replace the organization of employees, the business that has been obtained and the other items involved in such reproduction. To do this all possible sources of information have been used. Many items making up this cost can be determined with exactness, others with less exactness. Some of course are a matter of judgment. Where judgment is involved, the best judgment after considering everything has been used. The papers and the testimony of other engineers and the decisions of courts and commissions have been reviewed and studied. All of these things have been taken into consideration in reaching the conclusions in this appraisal. That there is, such a cost, and that there is such a value is now universally admitted, and in the Des Moines case the United States Supreme Court clearly stated that this element of value should be given consideration. In the Pioneer Telephone & Telegraph company case, 118 Pac. 354, 360, the Supreme Court of Oklahoma on the evidence, allowed for going concern value an amount equal to 20% of the reproductive value of the physical property and the New Jersey Supreme Court in the Public Service Gas company case, 87 Atl. 651, affirmed an allowance of an amount equal to 30% of the physical value of the property new.

A partial summary of the general elements that go to make up the Cost of Establishing Business is contained in the discussion by the New York Court of Appeals in People Ex. rel. Kings County Lighting company vs. Willcox et al. — N. E. 911, 912, says:

"It takes time to put a new enterprise of any magnitude on its feet after the construction work has been finished. Mistakes of construction have to be corrected, substitutions have to be made, economics have to be studied, experiments have to be made, which sometimes turn out useless. An organization has to be perfected, business has to be solicited, and advertised for, * * * gratuitous work has to be done, such as selling appliances at less than a fair profit, and demonstrating new devices * * * to educate the public. None of these things is reflected in the value of the physical property. The Company starts out with the bare bones of plant, to borrow Mr. Justice Lurton's phrase in the Omaha Water Works case (218 U. S. 180). By the expenditure of time, labor and money, it co-ordinates, those bones into an efficient working organization, and acquires a paying business. The proper and reasonable cost of doing that, whether included in operating expenses or not, is as much a part of the investment of the company as the cost of the physical property.

"Investors in a new enterprise have to be satisfied as a rule with meagre or no returns while the business is being built up * * * in a business classified among the public callings the rate-making power must allow for the losses during the lean years of their rate will be confiscatory and drives investors from the field."

Roughly speaking, there are two periods involved in establishing a complete working telephone exchange:

1. The construction period, and
2. The development period.

The Period of Construction

The construction period embraces the time which is necessary to erect the physical plant. The cost of this construction work, together with the interest and taxes during construction, is included in the appraisal of the reproduction new of the physical plant. During this construction period and before the plant can be put into operation something must be done besides construct the physical plant. It is necessary to conduct advertising and selling campaigns, in order to obtain subscribers with which to begin operation. The full number of subscribers would not be secured at once. The telephone is a necessity to some people, but to others it is a luxury. It is a fact that at the beginning, a telephone exchange never has its full quota or normal number of subscribers. Ordinarily it takes about two years after operation begins before this number is obtained.

Also during this construction it is necessary to build up a working organization, together with the necessary routines, instructions, etc. it is known, from actual experience what it costs to partially train an operator, and from this experience it may be determined that it would cost to train the operating force necessary in opening the Charlottesville exchange. In the case of the commercial and plant employees it is a little more difficult to determine what it would cost for training. The company has a great deal invested in its various employees and one method of ascertaining a portion of this amount is to compute about what such an employee could be obtained for, consider the advertising, the negotiations and the incidental expense such as traveling. These latter expenses with respect to certain types of skilled men, embrace traveling expenses for the employees and his family, moving expense of household goods, expense incurred for a short period while the employee is looking for a suitable residence, and the salary it would be necessary to pay him while he is adapting himself to the duties of the position he is to hold in this exchange. With the less important employees there would not be the same amount of expense, since many of them could be obtained locally, but for efficient telephone men for the more important work a great deal of care and expense would be incurred to ob-

tain and fit them in their new positions. Employees obtained locally would ordinarily require considerable training for their work in the telephone business.

Before service can be given, it is necessary to establish the necessary records for the commercial, plant and traffic departments. During the construction period there will also be incurred maintenance and renewal expense on parts of completed plant before the entire plant is ready for operation.

All of this represents money spent before service can be given; it is spent in addition to that used for constructing the physical plant, and represents legitimate and actual capital investment. The things for which this money is spent have a value and without such investment the plant could not start.

Now having obtained an organization of employees, necessary records and as many subscribers as possible during the construction period, the telephone exchange starts operation.

The Development Period

From experience, it is found that a telephone exchange begins operation with about 50% of the subscribers it will have two years later, that is, with about 50% of the normal number it can expect in the community. After two years of operation the growth is usually normal. The first two years of operation in a telephone exchange would ordinarily constitute the development period. By means of very careful computations, losses or deficits which would be sustained during this development period while the business was being built up to normal have been ascertained.

When a plant, consisting of as many items and elements as are found in Charlottesville, is being constructed a certain amount of maintenance will be necessary on portions of plant completed before the date of opening the exchange. Renewals on account of storms, fires, floods, municipal requirements and improvements and many kinds of casualties will have to be made.

The cost of establishing the business has been divided into two parts.

1. The expense during the construction period which includes building up the organization, attaching the business, maintenance $12,000

2. The operating deficits during the development period including deferred dividends.. 24,000

Total Cost of Establishing Business $36,000

The above figures do not provide for any expenditures which would be required for the following items:

Preliminary organization
Preliminary development
Financing
Securing Franchise
Legal Service during Preliminary Period
Preliminary Engineering Survey, etc.

Note: The amount claimed in this instance as shown on the summary of the appraisal is the conservative amount of $36,000.00, which is equivalent to 12% of the Telephone Plant $453,056.00.

Intangible Capital
Structural Overhead

The overhead charges of 15% as allowed in the appraisal in absence of actual facts as to the amount of money expended by the company during the initial construction, we have based our figures on what the overhead actually cost the company on new construction, done by it during the period in question is the best evidence of what such overhead would cost during the initial period.

The items included in intangible structural overhead are as follows:

Organization, cost of incorporation, counsel fees, fees for filing, initial tax paid to state, cost of corporation equipment, printing of stock, bonds, etc.

Engineering, supervision, salaries paid officers and clerks during construction, interest during construction on one-half the amount for a period of eighteen months, which time it would require to reproduce the property.

Liability insurance, including fire insurance, on the material in the warehouse during construction.

Contingencies, handling of material in the warehouse, breakage, loss and theft during construction, wear and tear on tools during construction, ommissions in appraisal.

The following are some allowances of overheads by other Commissions:

Wisconsin Railroad commission, In re Application of the Menomonee Falls Telephone company, C. L. 88, p. 1532; at p. 1536, 15% allowed to cover engineering, superintendence, omissions, interest, during construction, etc. Decided February 12, 1919.

Wisconsin Railroad commission, In re Application of Antigo Telephone corporation, C. L. 85, p. 489. Page 497, overhead allowances, 14%. Decided November 1, 1918.

Missouri Public Service commission in re Suspension of Rates of West Plains Telephone company, C. L. 84, p. 163. Twelve per cent for overhead considered conservative, as commission has approved as high as 15%. Decided October 1, 1918.

Illinois Public Utilities commission in re Application of Lyman Telephone company, C. L. 81, p. 793, 795—15%. Inventory Ommissions 5%. Decided July 1, 1918.

Missouri Public Service commission in re The Missouri & Kansas Telephone company, C. L. 81, p. 944, 949. 15% overhead. Decided July 31, 1918.

United States District Court for Northern District of Texas, 18.07% for overheads. Ft. Worth Rate case. Master's report approved April 4, 1919. Case not yet reported.

Questions of Judgment

After all, the questions presented in this study are largely questions of business judgment, and no rule can be laid down which can be applied mathematically to every situation. Each case must rest largely upon its own facts. It is therefore equally important to the public as well as the company that rates established be just and reasonable.

More Poles Mar Highway Sight Oregonians Aver.

Salem, Ore.—Stating that the erection of another pole line along the famous Columbia river highway would menace the beauty of the trail, state highway commissions seeks to force an agreement between the Pacific Telephone and Telegraph company and the Postal Telegraph company, whereby the latter will make use of the former's present poles along the river road.

Save Four Days in 24 Hours By Omitting "Party".

New York City.—Operators of the New York Telephone company are not to repeat the word "party". The company would be glad if its subscribers would neglect that word also. It is estimated 4 days will be saved every 24 hours, among 5,000 subscribers by the removal of "party" from the operator's vocabulary.

Kansas Industrial Court Peers Into Operators' Strike.

Horton, Kan. — Between 1,000 and 1,500 subscribers have been effected by a strike of union telephone operators called, it is said, because the company wanted to re-establish a pre-war custom of engaging part of the chief operator's time for clerical work. The Kansas Industrial Court has made an investigation which settled the differences.

Ira S. Weiss, New Sec.-Treas. of Keystone Company.

Philadelphia, Pa. — Ira S. Weiss, formerly assistant secretary-treasurer of the Keystone Telephone company has been elected secretary-treasurer to fill the vacancy caused by the death of Elwood F. Reeves.

Everyone Own Ad Expert

Northwestern Bell's Advertising Instructions Give Telephone Man Who Wants to Utilize Power of Press Benefit of Experience of F. C. Builta and Star Staff

In the territory served by the Northwestern Bell Telephone company this public utility is considered as ranking among the first half dozen most successful advertisers that part of the country knows.

As another highly successful advertiser has said, and is saying continually, "There's a reason."

Northwestern Bell's advertising didn't just grow. It is the result of the hard and able work of one of the foremost telephone advertising men, Frank C. Builta and a splendid staff, enjoying the fullest co-operation of the entire system. The publicity organization is credited with having built a business that stands second to none in public esteem.

Excerpts from the instructions which guide the several hundred managers of Northwestern Bell exchanges in their advertising and publicity efforts are printed here, for in them will be found a considerable number of valuable suggestions for telephone managers who are striving to utilize the power of publicity to the utmost.

Under the heading of "General Information," the Publicity Department tells the managers:

"The important work of selecting advertisements for his exchange, placing our advertising in newspapers and dealing with newspaper men, is under the direct personal supervision of the local commercial manager. Thus it is highly essential that each manager be fully acquainted with the purpose and method of our advertising and other publicity practices. It is essential, also, that each manager closely observe all opportunities to emphasize our advertising efforts, as set forth in these instructions, and to observe the result of our advertising.

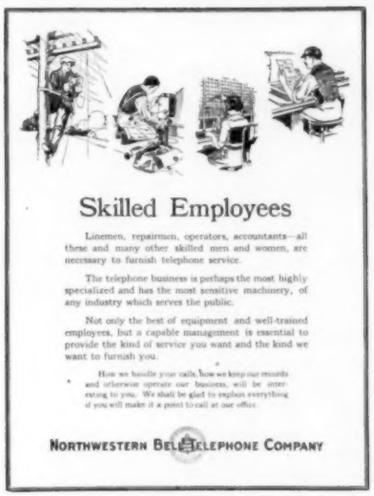
Why the Company Advertises.

"In all times, in all lands, public opinion has had control. Public opinion is but the concert of individual opinion, and is as much subject to change or to education. It is based on information and belief. If it is wrong, it is wrong because of wrong information and consequent erroneous belief."—Theodore N. Vail.

"Our advertising is intended to assist the efforts of our employees in giving the public correct information about our business—to furnish such information as will promote the most intelligent and considerate use of our service.

Neighborliness
Farm telephones make a neighborhood of the whole community and help greatly to dispel loneliness.
Long before the rural free delivery of mail or the good roads movement, this Company began to link up farm houses with neighboring towns and cities.
There is nothing that the farmer buys which, for the money, saves him so much time and effort and is such a social and business convenience as his telephone.
NORTHWESTERN BELL TELEPHONE COMPANY

Roadside Fires
One of the many things that put telephone lines out of service is a brush fire.
Although poles are seldom burned by brush fires, the heat often softens the wires. This takes the temper out and causes them to break in a short time.
When the telephone wires between two poles break, the poles on either side are also quite likely to be pulled down under the weight of the wires.
When anyone starts a roadside fire near a telephone line, he is endangering the community's telephone service and possibly cutting off communication between entire cities and states.
NORTHWESTERN BELL TELEPHONE COMPANY


Skilled Employees
Linemen, repairmen, operators, accountants—all these and many other skilled men and women, are necessary to furnish telephone service.
The telephone business is perhaps the most highly specialized and has the most sensitive machinery, of any industry which serves the public.
Not only the best of equipment and well-trained employees, but a capable management is essential to provide the kind of service you want and the kind we want to furnish you.
How we handle your calls, how we keep our records and otherwise operate our business, will be interesting to you. We shall be glad to explain everything if you will make it a point to call at our office.
NORTHWESTERN BELL TELEPHONE COMPANY

Our Advertising Policy.

"Our advertising is the printed representative of the Company.

"By the style of our advertising, people judge the character of our Company. Therefore we endeavor to have the appearance of our advertising dignified, conservative and clean cut.

"We generally illustrate our advertisements and use considerable white space to give them attention value. Different advertisements on the same subject are shown in the proof books because we believe that constant reiteration is essential to "drive home" our message. We also try to give information that the public will be glad to know,—that is we try to give our advertisements "news value".

"We are very careful that every word in our advertising is absolutely true. We have too much money invested to make false or exaggerated statements and thus cause people to lose confidence in us.

Relations with Newspaper Men.

"Our Company's standing in the community depends much on its position with the press.

"It is therefore desirable that Managers should maintain pleasant and friendly relations with newspaper men.

Authorized Advertising Mediums.

"Our advertising is practically confined to regular editions of newspapers published in towns where we operate, bill inserts, display cards and pamphlets.

"We do not take space in Sunday newspapers, in Friday or Saturday is-

sues of daily papers, or in special editions.

"Friday, Saturday and Sunday editions of daily newspapers and special editions are usually so crowded with advertising that our advertisements would not as likely be seen as if run at other times. Then again, because of the size, such papers are generally read less thoroughly than on other days.

"We like to confine our newspaper advertising to papers of strictly local circulation. This is why we do not take space in farm, trade or other class publications.

"We do not advertise in newspapers published outside our territory or in newspapers shipped in to be distributed under local name or date line.

"We do not advertise in premium lists, year books, programs, souvenirs or similar publications. These are of uncertain circulation and generally of little advertising value.

Contracts with Newspapers.

"When a newspaper requires a definite number of inches of advertising a year to make us a certain rate, the District Commercial Manager may approve such a contract if it does not exceed the number of column inches used in the newspaper the previous year and if the contract does not obligate us to use a certain amount of space but merely given us a lower rate if the designated amount is used during the year.

Equalizing Newspaper Space.

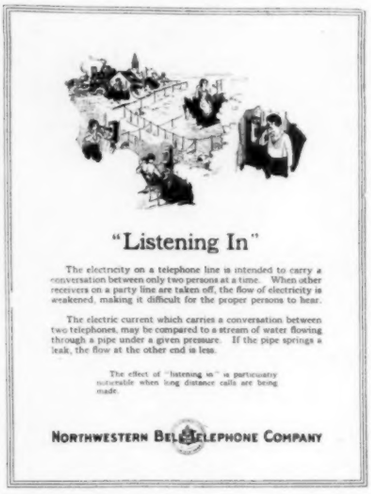
"Inasmuch as the importance of a newspaper in a community and the character of the paper and its circulation, are necessary factors in establishing its advertising rates, it is likely to be an equitable arrangement to use an equal amount of space in each of two or more newspapers of the same general character in a town.

"However, prestige and influence of a newspaper is to be considered. In cases where there is a paper of little prestige and one of considerably larger circulation or prestige, consideration should be given to the use of a different amount of space in one paper than in the other, depending on the relative worth of each paper to us as an advertising medium.

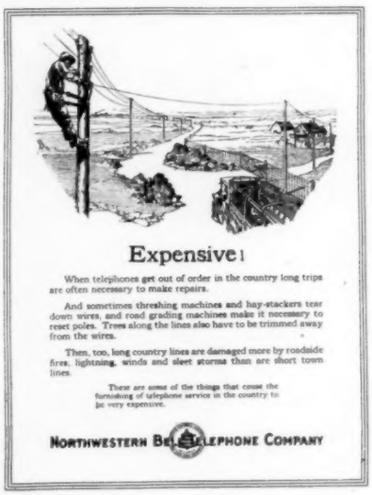
Ordering Advertisements.

"Proofs of all standard newspaper advertisements, in stiffcovered binders, are furnished Area Managers (and Local Managers) as well as Wire Chiefs and Chief Operators. The advertisements in the proof books are shown in 24-inch size only but the advertisements can be furnished in either 12-inch size (2 columns wide and 6 inches deep) or 24-inch size (3 columns wide and 8 inches deep.)

"From these proof books, Area Managers (or Local Managers), after conferring with their Chief Operators and Wire Chiefs, will select and recommend to the District Commercial Manager such advertisements as they feel will be desirable for use in their exchanges.


"Listening In"
The electricity on a telephone line is intended to carry a conversation between only two persons at a time. When other receivers on a party line are taken off, the flow of electricity is weakened, making it difficult for the proper persons to hear.
The electric current which carries a conversation between two telephones, may be compared to a stream of water flowing through a pipe under a given pressure. If the pipe springs a leak, the flow at the other end is less.
The effect of "listening in" is particularly noticeable when long distance calls are being made.
NORTHWESTERN BELL TELEPHONE COMPANY

Down It Goes!
Constant effort is exercised by the Telephone Company to keep every piece of equipment in condition for continuous service.
Your telephone instrument has 208 different parts. Much of its mechanism is as delicate as a watch.
You can help a great deal by never leaving your telephone where it is likely to be knocked to the floor and damaged, and by never leaving it near an open window where rain may put it out of order.
NORTHWESTERN BELL TELEPHONE COMPANY


Expensive!
When telephones get out of order in the country long trips are often necessary to make repairs.
And sometimes threshing machines and hay-stackers tear down wires, and road grading machines make it necessary to reset poles. Trees along the lines also have to be trimmed away from the wires.
Then, too, long country lines are damaged more by roadside fires, lightning, winds and sleet storms than are short town lines.
These are some of the things that cause the furnishing of telephone service in the country to be very expensive.
NORTHWESTERN BELL TELEPHONE COMPANY

"In the case of two or more exchanges comprising a local area, selections and recommendations of advertisements for each exchange will be made by the Area Manager after conferring with the Chief Operators and Wire Chiefs.

"In selecting the date the advertisement is to be run, the following suggestions may be helpful: In case of weekly papers, where two advertisements are to be used each month, the first and the third weeks are preferred. In case only one advertisement is used a month, the second or third week is preferred. In daily papers, Monday and Wednesday are generally the best days.

Other Departments' Advertising.

"The Traffic, Plant, Accounting and other departments will place their own advertising, and the newspaper will be asked to render a separate bill and send it to the official who ordered the advertising run. Such advertising will be limited to the employment of help, bids for construction and sale of materials.

Emergency News Matter.

"When emergencies arise, such as storms, fires, epidemics of sickness, etc., which affect telephone service, and about which mention in the newspaper would be helpful, the Area Manager (or Local Manager) will immediately prepare and furnish the papers with such news items. If the Manager is in doubt as to the advisability of giving certain information to newspapers or if he desires additional information he will confer with his District Commercial Manager.

"In giving news items to papers they should be submitted with the statement that they were prepared with the thought that they might be of interest to the public.

"When an emergency arises whereby service to and from points in other districts may be affected, information regarding the emergency shall be sent promptly by the District Commercial Manager to the Commercial Superintendent who will notify the Publicity Manager.

Emergency Advertising.

"If special advertising seems essential in an emergency the District Commercial Manager will confer with the Commercial Superintendent, making

specific recommendations as to the nature of the advertising desired. Then, if sufficient time can elapse before the emergency advertising is needed, the Commercial Superintendent will request the Publicity Manager to prepare the necessary advertising. The request should state the nature of the advertising desired and when it should be placed.

"If the emergency is such that enough time cannot elapse to allow the Publicity Department to prepare the advertising, the Commercial Superintendent may authorize the District Commercial Manager to place such advertising as seems necessary. A copy of all such advertising should be forwarded to the Publicity Manager for his files.

"In order that the provisions of these emergency instructions will be fully and properly carried out, the Division, District or Local heads of the Plant, Traffic and Accounting departments have instructions to report all emergency conditions immediately to the corresponding Commercial official.

Other Special Advertising.

Special advertising should be recommended to the District Commercial Manager by the Area Manager (or Local Manager) either to take the place of regular advertising or for additional advertising, in all cases where it is felt that circumstances warrant a special nature of advertising or an additional expenditure to give proper publicity to unusual conditions.

"Some of the conditions which might be explained in special advertising if advertisements in the proof books of standard newspaper advertisements will not apply, are:

"Party-line service conditions which are causing dissatisfaction because of "busy lines", too long conversations, discourtesy on the lines, etc.

"Farm-line difficulties due to too many on each line.

"Dissatisfaction about service over rural companies' lines due to improper maintenance.

"Failure to "Ring-off" in magneto exchanges.

"Dissatisfaction regarding advance collections.

"Public unrest due to delay in getting equipment.

"Reason for delays in installing switchboard parts, cable, instruments, etc.

"Reason for increases in rates.

"Reason for the adoption of certain operating practices.

"Necessity of calling by number.

"Slow or uncertain service due to sickness or the necessity of using new operators.

"Most of the above conditions might also be written up and given to the papers to use as news.

Miscellaneous Advertising Display Cards.

"Each month, one or more copies of a display card, similar to the American Telephone and Telegraph company's magazine advertisement for that month, is sent to Managers, intended for use in Commercial Offices, in window displays, pay station booths, etc.

Service Must Go On!
Lightning strikes and several telephone lines are out.
Rain begins to fall and freeze on the wires, a heavy wind rises, and mile after mile of sleet-weighted telephone wires are torn down.
Or perhaps just a few drops of water leak through some tiny hole in a telephone cable and several wires are short circuited and made useless.
When disaster or damage are reported, our every resource is centered on the restoration of service at the earliest possible moment.
Constant expense and unceasing effort are essential to provide satisfactory and uninterrupted telephone service.
NORTHWESTERN BELL TELEPHONE COMPANY

Why We Advertise
We are sometimes asked: "Why do you advertise, you have no competition?"
Some of the reasons why we advertise are:
We want our patrons to know everything we are doing and why we are doing it.
We want all subscribers to know the best way to use the telephone so as to get the greatest value from it.
We want everyone to know of new and extended uses of telephone service that will be helpful and profitable to them.
We try to make our advertisements interesting and helpful. Are you reading them?
NORTHWESTERN BELL TELEPHONE COMPANY

Both Must Be Paid
It is just as essential to the public that we pay fair wages for the use of the dollars invested in our property as it is to pay fair wages to our employees.
We cannot keep capable employees if we do not pay fair wages. And we cannot get the new money we need each year from investors to make improvements and extensions if we do not pay all expenses and earn a fair return.
In order to extend and develop our system to meet the demands of the public for service, this company must obtain millions of dollars from investors each year.
It is to the public's interest, as well as to the interest of the employee and the investor, that the telephone company be prosperous.
NORTHWESTERN BELL TELEPHONE COMPANY

"The number of copies of these cards to be sent each month to each exchange is regulated by information sent by the District Commercial Manager direct to the Publicity Manager. will notify their District Commercial Area Managers (or Local Managers) Managers promptly in case the number of cards being received each month is insufficient or too large.

"As a new supply of cards is received, the cards for the month previous should be taken down and the news cards put up. During the month the cards are on display, if any of them become disfigured to any considerable extent by weather conditions, smoke, pencil marks, etc., they should be taken down and replaced by others.

"The cards bend easily when set up, and when they are thus bent their appearance is unattractive. They should, therefore, be fastened up or put in frames in some way so that they may hang from the top.

"Managers should observe the results of the display of these cards.

Advertising Pamphlets.

"Occasionally, educational matter is prepared for distribution to the public in the form of pamphlets such as those issued entitled "Our Telephone Policy", "If a Giant Cut the Wires", "Story of a Great Achievement", "Things Worth Knowing About The Telephone," etc.

"Discretion should be used in distributing these pamphlets so that they are given to only those people likely to be interested. These pamphlets may be given to farmers when they are in the office and to merchants or professional men when the Local Manager visits them. The pamphlets may also be distributed judiciously if we have a display at fairs, exhibits, etc.

"Managers should endeavor to check the results of the distribution of any pamphlet, that they may be able to furnish this information to their District Commercial Manager if it is requested.

Window Displays.

"Managers are authorized, on approval by the District Commercial Manager, to incur a nominal expense for drayage, trimming, etc., for window displays.

"Managers will make a report to the District Commercial Manager as to the expense and apparent results from window displays placed. A copy of this report will be forwarded to the Commercial Superintendent.

"In arranging a window display, the first thing to consider is: What are you trying to accomplish—What is the object of the display?

"A good window display should do three things:

"1. It should be attractive so as to catch the eye of passers-by.

"2. It should be restful and dignified so as to "hold" the eye of the person attracted until the display is all seen.

"3. It should display the merchant's goods and our message effectively.

"Simplicity in window display work is desirable. The best windows usually contain the fewest goods. A crowded window bewilders the observer.

"A semi-circular or half-moon shape display is better than a square display because it gets the proper range of vision. You will notice that this plan is worked out on every theatrical stage where the flies and the arches "fade away" to form the scene. This effort is restful to the eye.

"Light woodwork with paper or inexpensive cloth covering makes a good background for a display, and does not cost much.

"Color need not be considered in detail in window display work. It must, however, be remembered that black absorbs all the rays of light and returns none and white is the reflection of all rays, none being absorbed. Thus it is desirable not to get too much white or too much black, but the display should vary from one color or the other, depending on the amount of light obtained. Too much bright color should not be used, as such a display does not emphasize the objects one wants the beholder to see.

"Scenic backgrounds are used a great deal in display, but often are made so that they do not accomplish the real purpose that the window display should bring about. They detract the eye, which should be centered upon the objects that are displayed.

News Items.

"Because the telephone enters into the daily life of merely every one, there is considerable public interest in telephone affairs. A few of the happenings which make good newspaper items are:

"1. Work being done in the exchange, such as:
Building or repairing farm or toll lines.
Establishing new cables.
Installing new switchboard parts or terminal equipment.

"2. An unusual increase in the number of subscribers.

"3. Damage to telephone property or service interruptions from storms, fires, accidents, etc.

"4. Changes in operating methods or other practices which affect the public.

"They Don't Answer"
Sometimes you may call a telephone number and do not get an answer, although you are positive that the called person is at home.
In such a case the person you called may have been in the kitchen, down in the basement or out in the yard, too far away from the bell to hear it—or too busy to answer it promptly.
In most cases business telephones are answered promptly, but the length of time of answers from residence telephones varies greatly.
Answering the telephone promptly is one of the little things that will help build up a better grade of telephone service for everyone.
NORTHWESTERN BELL TELEPHONE COMPANY

Your Servants
Thousands of dollars worth of property are often used in making a single long distance call, and for a local message you have the exclusive use, for the time being, of hundreds of dollars worth of property.
Not only an immense system of machinery and wires, but a force of well trained employees and a capable management are necessary to provide telephone service.
The services of all our employees and all our equipment are furnished at a price which enables you to get perhaps more pleasure and more benefit than for any other like amount of money you spend.
NORTHWESTERN BELL TELEPHONE COMPANY

Make Us a Visit!
We hope you can make it a point to visit the telephone central office the next time you are near.
We know you will be interested in the switchboard and other equipment and in seeing how your telephone calls are handled.
Your suggestions and experiences, we are sure, will aid us in our efforts to furnish you the most satisfactory service.
Drop in at any time and just say that you would like to be taken through.
NORTHWESTERN BELL TELEPHONE COMPANY

"5. Items calling attention to our newspaper advertising.

"Editors are generally anxious to obtain items that are of interest and they should be invited to ask the Manager for news. *The preparation* of occasional news items and their submission to newspaper men will encourage them to ask for material for stories.

News Item Policy.

"A Manager should not offer items to newspaper men unless convinced of their news value. The Manager should be sure that he would so consider them were he the editor.

"News items should be given to editors with the statement that the Manager is submitting them because it occurred to him that they might be of interest. The Manager should never suggest or intimate that he desires them published, or that it would be a special favor to him or to the Company to have them appear in the paper.

"News items involving the policy of the Company should always be referred to the District Commercial Manager before being offered to newspapers.

"Managers should endeaver to disrage the publication by newspapers of articles regarding the telephone company, its policies or service without first securing the facts. Willingness on the part of the Manager to obtain for the editor any information desired, will encourage newspaper men to seek from the Manager complete facts on all news items dealing with telephone matters before they commit the error of publishing an unjust statement based on wrong or incomplete information.

Report on Unfavorable Newspaper Comment.

"In case of any unfavorable newspaper editorial comment regarding the Telephone Company, the District Commercial Manager shall see personally or have the Manager interview the editor of the newspaper. The District Commercial Manager will then make a report as to the result of the conference to the Commercial Super-

News Items from Other Departments.

"District Plant Chiefs and District Traffic Chiefs should be asked by the District Commercial Manager to advise him of any condition arising in the work of their departments that may be of interest to the public. The

District Commercial Manager will in turn notify the Manager in the territory affected, so he may prepare such stories for the newspapers as may seem desirable.

"The Wire Chief and Chief Operator should also be asked by the Manager to notify him of any condition or event arising in their departments which is of news value.

"Among items that are of news interest which the Plant or Traffic Department should be asked to furnish, are service interruptions due to accidents, storms or fires, changes in operating methods affecting the public, new construction, etc.

News Items or Service Interruption.

"When, as a result of a storm, accident or other disaster there is an interruption of local or long distance service for a considerable number of subscribers Managers should get the facts and offer them to editors as a matter of news. The papers should be given the details of the trouble and told of the steps taken to restore service.

Newspaper Clippings.

"Every newspaper will be read by the Manager, or by a subordinate authorized by him, the day it is received, and items on the subjects herewith designated will be clipped out. Each clipping will then be *pasted* on the lower portion of a form which is to be filled in with town, name of paper, and date.

Character of Articles to be Clipped

"All news items or advertisements pertaining to or mentioning the following subjects will be clipped and mailed as provided in the foregoing:

"1. Advertsements of this Company or any other telephone company.

"2. Telephone service, telephone companies, their officials or employees.

"3. Proposed erection of electric light plants, electric interurban or street car lines, high tension power lines, or police alarm systems.

"4. Proposed street paving, underground conduit or sewer construction, or opening or widening of streets or alleys.

"5. Proposed erection of new buildings, of any character, costing $25,000 or more.

"6. The establishment of new industries employing 25 or more people.

"7. Statistics of the population or extent in area of cities.

"8. Taxation or assessed valuation of all property, telephone or other wise.

"9. Labor unions or organizations, strikes or labor agitation.

"10. Welfare and vocational educational work, including accident or insurance benefit plans of any corporations or industries.

"11. Statements of congressmen, legislators, state or city officials or candidates for these offices regarding control, regulation or ownership of public utilities.

A Typical "Bogey" of Northwestern Bell Advertising Space for Towns of Various Sizes.

(Does not include extension stations)

Size in Town Telephones		Normal Inches Per Month
Under 200		12
200–300		18
300–400		24
400–500		24
500–750		24
750–1000		24
1000–1500		36
1500–2000		36
2000–3000		48
*Muscatine	(3,089)	48
*Grand Forks	(3,148)	48
*Clinton	(3,857)	48
*Ottumwa	(4,013)	48
*Burlington	(4,549)	48
*Sioux Falls	(5,388)	60
*Fargo	(5,525)	60
*Dubuque	(6,639)	60
*Waterloo	(6,692)	60
*Cedar Rapids	(8,417)	60
*Davenport	(10,121)	60
*Duluth	(16,241)	72
*Des Moines	(23,664)	72
*Omaha	(37,311)	84
*Minneapolis	(65,274)	96

* Only daily papers used.
Note: Special conditions in some towns occasionally require more space than "bogey" and in some few instances we use less.

"12. Municipal, county, state or government ownership of public utilities.

"13. Insurance ordinance or laws.

"14. Bank organizations or failures.

"15. Changes in personnel of state railway commission or mention of candidates for this office.

"16. Crop reports and general business conditions.

"17. Official notices regarding road changes, roads to be vacated or roads to be established or to be moved.

List of Emergency Conditions.

"Following is a partial list of emergencies about which news stories should be given the papers if telephone service has been affected, and about which advertisements may be inserted if warranted and if approved by the Commercial Superintendent.

PLANT
- Exchange Property
  - Cable, poles or equipment burned by fires
  - Lines, or central office equipment affected by—
    - Lightning
    - Power wires
  - Cable damaged by other workmen
  - Wind and sleet storms
  - Poles broken by autos or other causes
  - Aerial cable punctured by bullets
  - Wires damaged by house movers (Hay stackers, threshing outfits, etc.)
  - Cable wet (Water in manholes, etc.)
  - Cables damaged by explosions
  - Wires cut
- Toll Lines
  - Damaged by—
    - Sleet
    - Floods and ice
    - Fire
    - Wind
    - Trees
    - Poles broken
  - Affected by Northern Lights
- Delayed Repairs
  - Sickness
  - Inclement weather
  - Railroad blockades (snow, washouts)
  - Railroad or express strikes

TRAFFIC (Local)
- Epidemics
  - Sickness of operators
  - Sickness of subscribers
- Street Car Tie-ups
  - Delay of operators
  - Delay of passengers reaching destination
  - Strikes
- -Fire Alarms (Calls for information)
- Large Conventions
- Unusual Events
  - Accidents
  - Carnivals
  - Floods
  - Fires
  - Other Disasters
  - Riots-Mobs
  - Holidays
  - Industrial Strikes

TRAFFIC (Toll)
- Unusual Events at other End of Circuit
  - Holidays observed at distant city but not observed locally. (Distant business houses closed.)
  - Conventions (National)
  - Disasters

ACCOUNTING
- Changes in billing methods, etc.

COMMERCIAL
- Delayed installations
  - Shortage of equipment
  - Shortage of help
  - Inclement weather
- Changes in telephone numbers
  - Regrouping Lines
  - Changing in central office equipment
- Changes in office quarters
  - Central Office location
  - Business office location
- Revision in collection practices
  - Discontinuance of collectors, etc.

Outline of News Story or Advertisement.

"The following outline should be followed in preparing a news story or advertisement covering an emergency condition.

"Not all the questions indicated can be answered in a news story or advertisement covering a fire, storm, street car strike, epidemic of sickness or other emergency but those that are applicable should be answered in about the order given.

1. What happened?
2. Where did it happen?
3. When did it happen?
4. How did it affect telephone service?
   - Unusual traffic load?
   - Normal number of calls per hour?
   - Number of calls per hour during emergency?
   - Number of extra operators to handle load?
   - Or lines put out of service?
   - Number of lines affected?
   - What lines affected?
   - Number of subscribers affected?
5. What is being done or was done to restore service–
6. How soon was or will the emergency condition be cleared?
7. When can normal service be expected?
8. What was the Telephone Company's financial loss, approximately?

Sample News Story.

"The following story is a sample one which might be written immediately after a cable and two poles have been destroyed by fire.

"The sample story below illustrates how the outline was used to write a newspaper article. Not all the points indicated in the outline are covered but all are used which apply to the situation.

"In submitting information to the newspapers covering an emergency condition it is desirable that the Commercial Manager will write up each story, following the general plan as followed below, always checking against the outline to see that all points are covered.

Fire Melts Big Cable Cutting off 32 Subscribers.

Nearly one hundred feet of telephone cable, containing fifty telephone circuits was destroyed last night by the Smith grocery store fire, and all telephone patrons on the East side are today without service.

The intense heat melted the big cable, and in addition two large telephone poles were also damaged by the flames.

Manager James Brown of the telephone company notified district headquarters at Duluth at once of the damage, and two skilled cable repairmen arrived on the noon train with emergency supplies. Work on the necessary repairs is now under way.

It is expected that service will be restored by this evening to all telephone users now cut off from the central office.

The loss of the telephone company for labor and materials in making the repairs was about $100.

RECOMMENDATION FOR NEWSPAPER ADVERTISING

FOR _____ EXCHANGE

NEW OR ADDITIONAL ADVERTISING _____ DATE _____

CHANGE IN SPACE OR RATE _____

TOWN _____ POPULATION _____ TOTAL TOWN STATIONS _____

PAPER _____ DAY ISSUED _____

CIRCULATION _____ LANGUAGE _____ EDITOR _____

GENERAL CHARACTER OF PAPER _____ OWNER _____

ATTITUDE TOWARD THE TELEPHONE COMPANY _____

COLUMNS PER PAGE _____ WIDTH OF COLUMNS _____ LENGTH OF COLUMNS _____

ADVERTISING RATE PER INCH: STEREO $ _____ COMPOSITION $ _____ USE MATRICES _____

RECOMMEND _____ INCHES OF ADVERTISING PER MONTH AT AN EXPENSE OF $ _____ PER MONTH

FOR A PERIOD OF _____

CHARACTER OF ADVERTISING RECOMMENDED _____

REASONS FOR RECOMMENDATION _____

NUMBER OF BUSINESS STATIONS USED BY PAPER _____ NET MONTHLY BUSINESS TELEPHONE RENTAL $ _____

CHANGE IN STEREO RATE: FROM $ _____ PER INCH TO $ _____ PER INCH. DATE EFFECTIVE _____

CHANGE IN COMPOSITION RATE: FROM $ _____ PER INCH TO $ _____ PER INCH. DATE EFFECTIVE _____

CHANGE IN MONTHLY ADVERTISING SPACE: FROM _____ INCHES TO _____ INCHES. DATE EFFECTIVE _____

NAMES OF OTHER PAPERS AT THIS EXCHANGE _____

DO WE ADVERTISE IN OTHER PAPERS _____ IF SO, SHOW INFORMATION AS FOLLOWS:

NAME OF PAPER	CIRCULATION	DAY ISSUED	STEREO RATE PER INCH	NUMBER OF INCHES USED MONTHLY
			$	
			$	
			$	

AUTHORIZED _____ APPROVED _____ RECOMMENDED _____

GENERAL COMMERCIAL SUPERINTENDENT COMMERCIAL SUPERINTENDENT DISTRICT COMMERCIAL MANAGER

NEWSPAPER ADVERTISING RECORD

TOWN	OFFICE PHONE RENTAL, $		MONTHLY
OWNED STATIONS	MONTHLY SPACE		INCHES
NEWSPAPER	MONTHLY COST, $		
DAYS ISSUED	STEREOTYPE RATE, $		PER INCH
CIRCULATION	COMPOSITION RATE, $		PER INCH
PUBLISHER	PRINTS DIRECTORY		

YEAR	DATE AND SPACE USED				TOTAL INCHES	TOTAL COST	DATE BILL APPROVED	REMARKS
	DATE	INCHES	DATE	INCHES				
JANUARY								
FEBRUARY								
MARCH								
APRIL								
MAY								
JUNE								
JULY								
AUGUST								
SEPTEMBER								
OCTOBER								
NOVEMBER								
DECEMBER								
TOTAL								

These forms help Northwestern Bell in placing and checking its advertising.

Offers Phone Nomenclature

American Institute of Electrical Engineers Prepares List of Telephone Terms As Move to Prevent Confusion Arising from Different Interpretations of Trade Talk

Confusion in telephone nomenclature will be greatly reduced with the general adoption of the standard nomenclature recently proposed by the American Institute of Electrical Engineers.

Variances in defining telephonic terms have been frequent causes of costly misunderstandings, and the A. I. E. E. nomenclature, in clearing these differences performs a valuable service for the industry.

The Institute's nomenclature follows. It is preceded by a note which says:

"Many of the following definitions are tentative and not yet fully established. Criticisms and suggestions, addressed to the Secretary of the Standards Committee, will be welcomed. Some of the definitions are specific to telephony, and differ in detail from similar definitions appearing in other parts of the rules."

DEFINITIONS

Line Circuits

12000 Ground-Return Circuit.—A ground-return circuit is a circuit consisting of one or more metallic conductors in parallel, with the circuit completed through the earth.

12001 Metallic Circuit.—A metal-circuit is a circuit of which the earth forms no part.

12002 Two-Wire Circuit.—A two-wire circuit is a metallic circuit formed by two parallel conductors insulated from each other.

12003 Superposed Circuit.—A superposed circuit is an additional circuit obtained from a circuit normally required for another service, and in such a manner that the two services can be given simultaneously without mutual interference.

12004 Phantom Circuit.—A phantom circuit is a superposed circuit, each side of which consists of the two conductors of a two-wire circuit in parallel.

12005 Side Circuit.—A side circuit is a two-wire circuit forming one side of a phantom circuit.

12006 Non-Phantomed Circuit.—A non-phantomed circuit is a two-wire circuit, which is not arranged for use as the side of a phantom circuit.

12007 Simplexed Circuit.—A simplexed circuit is a two-wire telephone circuit, arranged for the superposition of a single ground-return signalling circuit operating over the wires in parallel.

12008 Composited Circuit. — A composited circuit is a two-wire telephone circuit, arranged for the superposition on each of its component metallic conductors, of a single independent ground-return signalling circuit.

12009 Quadded or Phantomed Cable.—A quadded or phantomed cable is a cable adapted for the use of phantom circuits.

12010 Simplex Circuit.—A simplex circuit in telegraphy is one arranged for operation in one direction at one time.

12011 Duplex Circuit.—A duplex circuit in telegraphy is one arranged for simultaneous operation in opposite directions.

12012 Diplex Circuit.—A diplex circuit in telegraphy is one arranged for the simultaneous transmission of two messages in the same direction.

12013 Quadruplex Circuit.—A quadruplex circuit in telegraphy is one arranged for the simultaneous transmission of two messages in each direction.

12014 Multiplex Circuit.—A multiplex circuit in telegraphy is one arranged for the simultaneous transmission of one or more messages in both directions. Both duplex and quadruplex are examples of multiplex whereas diplex is not.

12015 Linear Electrical Constants.—The linear electrical constants of a line are the electrical constants per unit length of the line, *e. g.* linear resistance, linear inductance, etc.

12016 Smooth Line.—A smooth line is a line whose electric elements are all continuously and uniformly distributed throughout its length.

12017 Periodic Line.—A periodic line is a line consisting of successive similar sections in each of which one or more electric elements are not distributed uniformly. As examples of periodic lines are (1) loaded lines and (2) artificial lines consisting of successive similar sections of lumped constants.

The term periodic in this definition refers to the line constants and not to time relations.

12018 Equivalent Smooth Line.—An equivalent smooth line of a periodic line is a smooth line having the same electrical behavior as the periodic line, at a given single frequency, when measured at terminals or at corresponding section junctions.

12019 Equivalent Periodic Line.—An equivalent periodic line of a smooth line is a periodic line having the same electrical behavior, for an assumed single frequency, as the smooth line, when measured at terminals or at corresponding section junctions. The terms conjugate smooth line and conjugate periodic line are also sometimes used.

12020 Composite Line.—A composite line is a line consisting of a plurality of successive sections having different linear electrical constants, as in the case where an underground cable section is joined to an overhead open-wire section.

12021 Loaded Line.—A loaded line is one in which the normal reactance of the circuit has been altered for the purpose of increasing its transmission efficiency.

12022 Series Loaded Line.—A series loaded line is one in which the normal reactance has been altered by reactance serially applied.

12023 Shunt Loaded Line. — A shunt loaded line is one in which the normal reactance of the circuit has been altered by reactance applied in shunt across the circuit.

12024 Continuous Loading.—A continuous loading is a series loading in which the added inductance is uniformly distributed along the conductors.

12025 Coil Loading.—A coil loading is one in which the normal inductance is altered by the insertion of lumped inductance in the circuit at intervals.

This lumped inductance may be applied either in series or in shunt.

As commonly understood, coil loading is a series loading, in which the lumped inductance is applied at uniformly spaced recurring intervals.

Circuit Constants and Characteristics

12050 Damping of a Circuit.—The damping at a given point in a circuit from which the source of energy has been withdrawn, is the progressive diminution in the effective value of electromotive force and current at that point resulting from the withdrawal of electrical energy.

12051 Damping Constant.—The damping constant of a circuit is a measure of the ratio of the dissipative to the reactive component of its admittance or impedance.

Applied to the admittance of a condenser or other simple circuit having capacity reactance, the damping constant for a harmonic electromotive force of given frequency is the ratio of the conductance G, of the condenser or simple circuit at that frequency to twice the capacitance, C, of the condenser at the same frequency, $(G/2C)$.

Applied to the reactance of a coil or other simple circuit having inductive reactance, the damping constant for a harmonic current of a given frequency is the ratio of the resistance, R, of the coil or circuit at that frequency to twice the inductance, L, at the same frequency $(R/2L)$.

12052 Mutual Impedance.—The mutual impedance for single frequency alternating currents, between a pair of terminals and a second pair of terminals of a network, under any given condition, is the negative ratio of the electromotive force produced between either pair of terminals on open circuit to the current flowing between the other pair of terminals.

A receiving-end impedance is an example of a mutual impedance.

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

12053 Self-Impedance. — The self-impedance between a pair of terminals of a network, under any given condition, is the ratio of the electromotive force applied across the terminals to the entering current.

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

12054 Characteristic Impedance.—The characteristic impedance of a line is the ratio of the applied electromotive force to the resulting steady-state current upon a line of infinite length and uniform structure, or of periodic recurrent structure.

In practice, the terms (1) line impedance, (2) surge impedance, (3) iterative impedance, (4) sending-end impedance, (5) initial sending-end impedance, (6) final sending-end impedance, (7) natural impedance and (8) free impedance, have apparently been more or less indefinitely and indiscriminately used as synonyms with what is here defined as "characteristic impedance."

Single frequency voltages and current are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

12055 Sending-End Impedance.—The sending-end impedance of a line is the ratio of the applied electromotive force to the resulting steady-state current at the point where the electromotive force is applied.

See note under "Characteristic Impedance." In case the line is of infinite length of uniform structure or of periodic recurrent structure, the sending-end impedance and the characteristic impedance are the same.

Singe frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

12056 Propagation Constant.—The propagation constant of a uniform line, or section of a line of periodic recurrent structure, is the natural logarithm of the ratio of the steady-state currents at various points separated by unit length in a uniform line of infinite length, or at successive corresponding points in a line of recurrent structure of infinite length. The ratio is determined by dividing the value of the current at the point nearer the transmiting end by the value of the current at the point more remote.

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

12057 Attenuation Constant.—The attenuation constant for a single frequency is the real part of the propagation constant taken at that frequency.

12058 Wave-Length Constant. — The wave-length constant is the imaginary part of the propagation constant.

12059 Standard Cable.—A standard cable is an ideal uniform line in terms of which the attenuation of a line or network may be specified. It is characterized by the following constants: Linear resistance, 88 ohms per loop mile (54.7 ohms per loop km.). Linear capacitance between wires 0.054 microfarad per loop mile (0.03355 microfarad per loop km.). Linear inductance and linear leakance, 0.

Equivalent Circuits

12102 Equivalent Circuit.—An equivalent circuit is a simple network of series and shunt impedances, which, at a given frequency, is the approximate electrical equivalent of a complex network.

12103 "T" Equivalent Circuit.—A "T" equivalent circuit is a triple-star or "Y" connection of three impedances externally equivalent to a complex network. See Fig. 12-1 for symbol.

12104 "I" Equivalent Circuit.—An "I" equivalent circuit is a connection of five impedances in the form shown in Fig. 12-2, which is externally equivalent to a complex network. It differs from the "T" equivalent circuit in that the impedances are arranged symmetrically on the two sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

12105 "Π" Equivalent Circuit.—A "Π" equivalent circuit is a delta connection of three impedances externally equivalent to a complex network. It is also called a "U" equivalent circuit. See Fig. 12-3 for symbol.

12106 "O" Equivalent Circuit.—An "O" equivalent circuit is a con-

nection of four impedances in the form shown in Fig. 12-4, externally equivalent to a complex network. It differs from the Π equivalent circuit in that the impedances are arranged symmetrically on the two sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

Telephony

12200 Manual Telephone System.—A manual telephone system is one in which the calling party gives his order to an operator who completes the call directly by hand, either with or without the assistance of one or more additional operators.

12201 Automatic or Full Mechanical Telephone System.—An automatic or full mechanical telephone system is one in which the calling party is enabled to complete a call by remote-control switches without the aid of an operator.

12202 Semi-Automatic or Semi-Mechanical Telephone System.—A semi-automatic or semi-mechanical telephone system is one in which the calling party gives his order to an operator who completes the call through remote-control switches.

12203 Telephone Exchange. — A telephone exchange consists of one or more central offices with associated plant, by means of which telephone service is rendered in a specified local community.

12204 Telephone Exchange Area or District.—A telephone exchange area or district is the area or district served by a telephone exchange.

12205 Central Office.—A central office is a switching center for interconnecting lines terminating therein.

12206 Toll Central Office.—A toll central office is one in which toll and long distance lines terminate.

12207 Local Central Office.—A local central office is one in which subscriber's lines terminate.

12208 Private Branch Exchange (Generally Abbreviated "P. B. X.").—A private branch exchange is a telephone system generally installed on the premises of a subscriber, including a switchboard and extension sets, and connected to a central office, affording intercommunication between the extension sets and also between these sets and the central office.

12209 Private Exchange.—A private exchange is one which

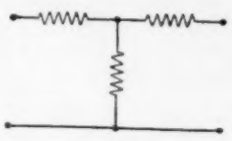


FIG. 12-1

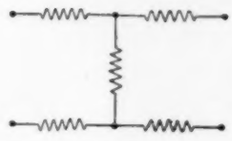


FIG. 12-2

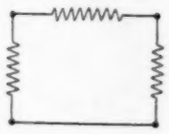


FIG. 12-3

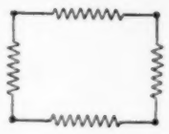


FIG. 12-4

serves one business organization or individual, and is not connected to a central office.

12210 Private Exchange.—A private automatic exchange is an automatic exchange which serves one business organization or individual, and is not connected to a central office.

12211 Subscriber Set (Often Abbreviated to "Subset").—A subscriber set is an assembly of apparatus for sending and receiving telephone calls.

12212 Subscriber Station (Often Abbreviated to "Substation").—A subscriber station is an installed subscriber set connected to a central office for the purpose of sending and receiving telephone calls.

12213 Pay Station.—A pay station is a subscriber station available for the use of the public on the payment of a fee. The fee may be either deposited in a coin box or paid to an attendant.

12214 Toll Station.—A toll station is a pay station located outside of a local service area and affording toll and long distance service only.

12215 Subscriber Line or Subscriber Loop.—A subscriber line or subscriber loop is the wire connection between a subscriber station and the central office.

12216 Subscriber Line Circuit.—A subscriber line circuit is a subscriber line with its associated individual central office apparatus.

12217 Individual Line.—An individual line is a subscriber line which connects one subscriber station to a central office, though it may have one or more extension sets.

12218 Party Line.—A party line is a subscriber line which connects two or more subscriber stations to a central office.

12219 Tip Side or Tip Wire, Ring Side or Ring Wire.—The tip side or wire, or the ring side or wire, is that conductor of a circuit which is associated with the corresponding member of a jack.

12220 Negative Side or Negative Wire Positive Side or Positive Wire.—The negative side or wire, or the positive side or wire, is that conductor of a circuit which is normally connected to the corresponding pole of a battery.

12221 Main Distributing Frame.—A main distributing frame is a structure for terminating the permanent inside and outside wires of a central office and for effecting flexible junctions between them.

12222 Intermediate Distributing Frame. — An intermediate distributing frame is a structure for terminating permanent inside wires of a central office and for effecting flexible junctions between them.

12223 Switchboard. — A switchboard is an assemblage of apparatus in a coordinate structure for switching talking and signaling circuits.

12224 Switchboard Section.—A switchboard section is an element or unit one or more of which constitutes a complete manual switchboard.

12225 Operating Room.—An operating room is a room which contains a manual switchboard and associated apparatus.

12226 Combination Current.—A combination current consists of two or more currents of different characteristics in the same circuit. As ordinarily used the term refers to currents whose characteristics are steadily maintained, as for example, a combination of direct current and an alternating current.

12227 Manual Ringing. — Manual ringing is ringing which is affected by and continues with the operation of a key.

12228 Machine Ringing.—Machine ringing is intermittent and is caused to act periodically by the apparatus itself.

12229 Superimposed Ringing Current.—A superimposed ringing current is a combination current for ringing, consisting of a direct and an alternating current.

12230 Pulsating Ringing Current.—A pulsating ringing current is current for ringing in which the succeeding impulses are separated by intervals approximately equal to those of the impulses themselves.

12231 Harmonic Selective Signaling.—Harmonic selective signaling employs devices tuned mechanically or electrically to the frequency of the ringing current, so that each device will not operate when receiving current intended to operate another device.

12232 Multiple Harmonic Signaling.—Multiple harmonic signaling employs frequencies which are integral multiples of the lowest frequency.

12233 Non-Multiple Harmonic Signaling.—Non-Multiple harmonic signaling employs frequencies which are not integral multiples of the lowest frequency.

12234 "To Call".—"To call" is to originate a telephone call.

12235 "To Dial".—"To dial" a number is to use a dial type of calling device in order to control automatic switches.

12236 "To Set Up".—"To set up" a number is to use a key type or multiple lever type of calling device in order to control automatic switches.

12237 Calling Device.—A calling device is an apparatus by means of which automatic switches are controlled for the purpose of establishing a connection.

12238 Calling Party.—A calling party is a person who originates a telephone call.

12239 Called Party. — A called party is the person who answers when a station is called.

12240 Reverting Call.—A reverting call is one between two stations on the same subscriber line.

12241 Telephone Traffic.—Telephone traffic is the aggregate volume of communication handled in a given time.

12242 "Busy".—"Busy" is the condition of a line or an apparatus when it is in use.

12243 Free.—Free is the condition of a line or an apparatus when it is not in use. Free is the opposite of busy.

12244 "To Make Busy". — "To make busy" is to cause a line or an apparatus to appear to be busy.

12245 "To Release" or to "Disconnect".—"To release" or "to disconnect" is to terminate a telephone connection by disengaging the apparatus.

12246 "To Clear".—"To clear" is to restore a line or an apparatus to the free condition.

12247 Trunk.—A trunk is the wire connection between switching devices or central offices.

12248 Trunk Circuit. — A trunk circuit is a trunk with its associated individual apparatus.

12249 Trunked Call. — A trunked call is one which employs an inter-office trunk or a trunk between two switchboard positions.

12250 Relay.—A relay is a device by means of which contacts in one circuit are operated by a change in conditions in the same circuit or in one or more associated circuits. (See Rule **4016** Standardization Rules, A. I. E. E., 1918).

12251 Polar Relay.—A polar relay is a relay which operates in response to a change in the direction of the current in the controlling circuit.

12252 Quick Operating Relay.—A quick operating relay is one which operates its contacts within a specified brief time limit.

12253 Quick Release Relay. — A quick release relay is one which releases its contacts within a specified brief time limit.

12254 Quick Acting Relay. — A quick acting relay is one which has the properties of both a quick operating and a quick release relay.

12255 Slow Operating Relay.—A slow operating relay is one which will not operate until after a specified delay.

12256 Slow Release Relay. — A slow release relay is one which when operated will not release until after a specified delay.

12257 Slow Acting Relay.—A slow acting relay is one which has the properties of both a slow operating and a slow release relay.

12258 Line Relay.—A line relay is one whose coil is normally in the line circuit.

12259 Cut-Off Relay.—A cut-off relay is one which when operated disconnects from a line apparatus normally connected to it.

12260 Relay Coil Section.—A relay coil section is one of two or more windings of a coil on one and the same core. The several sections may be concentric or placed side by side on the core.

12261 Tension Spring.—A tension spring is one which functions to exert mechanical pressure but does not carry an electrical current.

12262 Contact Spring.—A contact spring is one which takes an electrical part in switching a circuit.

12263 Main Contact Spring.—A main contact spring is one which may switch a circuit between two or more other contact springs.

12264 Armature Spring.—An armature spring is the first of a group to be moved by the armature. It may or may not be a main contact spring.

12265 Plunger Spring.—A plunger spring is the first of a group to be moved by the plunger.

12266 Impulse Springs.—Impulse springs are those which act to make or break a circuit for the purpose of sending impulses.

12267 Make-Before-Break Contact Springs (Abbreviation "M. B. B."). — Make-before-break contact springs are those in which the main spring touches the front contact before it breaks away from the back contact. Also called a continuity preserving contact.

12268 Back Contact Spring.—A back contact spring is one against which the main contact spring rests when in the normal position.

12269 Front Contact Spring.—A front contact spring is one against which the main spring rests when in the operated position.

12270 Automatic Signaling.— Automatic signaling is affected without the aid of an operator.

12271 Automatic Switch.—An automatic switch is a remote control device for controlling talking or signaling circuits.

12272 Finder Switch. — A finder switch is a switch connected to one of a smaller number of circuits and which finds automatically a circuit out of a larger number of circuits from whence the signal comes.

12273 Line Switch.—A line switch is a switch connected to one of

a larger number of circuits from which a signal comes and which finds automatically a circuit out of a smaller number of circuits.

12274 Selector Switch.—A selector switch is a switch whose duty is to select a particular group of trunks and one trunk of the group selected. In particular cases, one of these functions may be omitted.

12275 Connector Switch or Final Selector.—A connector switch or final selector is a switch whose duty is to establish a connection with the called line. It is usually operated by the last digit or digits of the call number.

12276 Switch Frame. — A switch frame is a structure for mounting an assembly of switching apparatus which may be integral therewith.

12277 Section of Switches.—A section of switches, considered from a trunking standpoint, is a group of adjacent switches whose banks are multiplied together.

12278 Switchroom.—A switchroom is a room which contains an assemblage of automatic switches and associated apparatus.

12279 Bank Wires.—Bank wires are those wires which multiple adjacent switch banks to each other.

12280 Bank Cable.—A bank cable is one which connects a switch bank to a terminal rack.

12281 Multiple Cable.—A multiple cable is one which multiples together two or more sections of switch banks by connecting together their terminals.

12282 Impulse. — An impulse is any sudden change of brief duration produced in the current of a circuit.

12283 Make Impulse.—A make impulse is an impulse due to a temporary flow of current.

12284 Break Impulse.—A break impulse is an impulse due to a temporary interruption of current.

12285 Impulse Frequency. — The impulse frequency is the number of impulses occurring per second. The reciprocal of this is the impulse period.

12286 Impulse Period.—The impulse period is the period of time included between the corresponding points in periodically recording impulses. It thus corresponds to the period of alternating current.

12287 Impulse Ratio.—Impulse ratio is the ratio of duration of an impulse to the impulse period.

12288 Impulse Circuit. — An impulse circuit is one through which impulses are transmitted.

12289 Telephone Impulse Repeater.—A telephone impulse repeater is a device for repeating impulses from one line circuit into another and for performing other duties.

12290 Supervisory Signal.—A supervisory signal is a device for attracting attention of an attendant to a duty in connection with switching apparaus or its accessories. This includes cord supervisory lamps on a manual switchboard and the supervisory lamps in an automatic exchange which indicates that a switch has been occupied but has not completed its function.

12291 Tell-Tale Signal. — A tell-tale signal is a device for locating the failure of some apparatus; for example, the blowing of a fuse, the continued drawing of heavy current by apparatus intended to receive only momentary current, etc.

12292 Alarm Signal. — An alarm signal is a sound producing device for attracting attention to either a supervisory or a tell-tale signal.

12293 Amplifier.—See §13040.

12294 Telephone Repeater. — A telephone repeater is a device for amplifying a voice current from one line circuit into another line circuit.

12300 Telephone Receiver.—A telephone receiver is an electrically operated device designed to produce sound waves or vibrations which correspond to the electromagnetic waves or vibrations actuating it.

12301 Microphone.—A contact device designed to have its electrical resistance directly and materially altered by slight differences in mechanical pressure.

12302 Telephone Transmitter.—A telephone transmitter is a sound-wave-operated or vibration-operated device designed to produce electromagnetic waves or vibrations which correspond to the sound waves or vibrations actuating it.

12303 Coefficient of Coupling of a Transformer.—The coefficient of coupling of a transformer at a given frequency is the ratio of the mutual impedance between the primary and secondary of the transformer, to the square root of the product of the self-impedances of the primary and of the secondary.

John Dolan Elected President N. E. Telephone Union.

Providence, R. I. — John Dolan, of Boston, was elected president of the International Brotherhood of Telephone Workers at its second annual convention. Other officers elected were: John J. Dolan of Boston, president; John S. Morley, Boston, Norman N. Halpine, Portland, Me., George F. Mahoney, Boston, vice presidents; George L. Kelley, Boston, secretary; Timothy F. Murphy, Boston, treasurer; Joseph H. McLaughlin, Boston, William L. Broder, Boston, John E. Fitzgerald, Boston, Harry Muzzey, Springfield, A. P. Bouchard, Providence, Edwin J. Ames, New Bedford, Thomas B. Delaney, Lowell, Leon W. Weir, Portland, Henry B. McKeon, Manchester, executive council.

No Pay, No Audit; That's Status of Tennessee Phone Case.

Nashville, Tenn. — Following denial of an increase to the Cumberland Telephone and Telegraph company, by the Tennessee Railroad and Public Utilities commission, the Cumberland refuses to pay cost of appraisal and audit of its books ordered by the commission. According to local statements there is no law to compel the Cumberland to pay these costs.

Illinois Commission Approves Independent's Bell Buy.

Springfield, Ill. — Consolidation of Independent and Bell exchanges at White Hall, Roodhouse, Carrollton, Jacksonville, and other points in Greene and Fulton counties, has been approved by the Illinois utility commission.

Kansas Corn Grows So High It Shorts Phone Lines.

Hiawatha, Kan.—Corn in this territory is growing so high it is hanging over rural telephone lines and seriously impairing transmission. Farmers threaten staunch resistance to any effort of telephone men to saw, chop, or blast, down the offending giant stalks.

12304 Repeating Coil. — A term used in telephone practice meaning the same as transformer, and ordinarily a transformer of unity ratio.

12305 Retardation Coil. — A retardation coil is a reactor (reactance coil) used in a circuit for the purpose of selectively reacting on currents which vary at different rates.

IMPROVES CHARGING

Telephone Battery Charging Methods With G. E. Tungar Rectifiers

Schenectady, N. Y.—Tungar Rectifiers, originally developed for use in charging automobile starting and lighting batteries, are invading many other fields, as a result of continual development work by the Research Laboratory of the General Electric company.

One field in particular where their qualities have made them highly successful is that of charging the batteries for telephone lines, especially in the more isolated branch exchanges. The General Electric company says, "For such use they have been found to have decided advantages over either the vibrating or chemical type of rectifier, as the former is subject to sticking of contacts, short circuiting the battery through the rectifier, and the latter is an unsatisfactory affair at best owing to the use of liquid electrolyte."

G. E. Says This Rectifier Improves Charging.

There are two methods of applying the rectifier to the lines, depending on the type to be used. The first method is to use a noiseless type floated directly across the batteries on the line and the second method is to use two batteries one of which is being charged, while the other is on the line. There are several Tungars used for the second method the size depending on the size of the battery. One of these which has a 24 and 30 volt tap, and about 6 ohms resistance, has been found economical for charging the 11 and 12 volt batteries used in private branch exchanges. It possesses considerable inherent regulation in the transformer, making it possible to charge at one ampere, 40 volts, or as low as 28 volts three amperes on the 30 volt tap. The efficiency of the set is approximately 50 or 55% except where considerable resistance is used, when it drops from 30 to 35% with all the resistance in.

For the larger private exchanges using power switchboards a 30 volt 10 ampere set, with an efficiency at full load about 59% or a 40 volt, 12 ampere set with a full load efficiency of 63% or 69% at 46 volts 10.8 amperes generally is used. By putting a considerable amount of reactance in series between either of these rectifiers and the battery under charge and discharge on the line, they can be made as noiseless as any rectifier or generator.

In cases where a noiseless rectifier is used, and floated directly across the line and the batteries, a type has been designated for continuous 24 hour operation. It delivers just enough power to take care of the discharge and the losses. The set has a resistance stick inside the case so that the floating current can be adjusted from .3 to .5 amperes on 11 or 12 cells. It is especially valuable for smaller branch exchanges at some distance from the central offices, or where it is impractical to charge through the trunk lines from the central office. With a continuous floating charge the operator is relieved of the responsibility of charging the battery, and damage to the battery from either overcharge, or from being run too low, is eliminated.

$600,000 New Exchange for Covington, Ky.

Covington, Ky.—Officials of the Citizens' Telephone company of Kentucky, a subsidiary of the Cincinnati and Suburban Bell Telephone company, state approximately $600,000 will be spent for a new exchange in this city.

BOOK REVIEWS.

Publishers Present New Books That Supply Industry With Needed Information.

TELEPHONE RATES AND VALUES, by Charles W. McKay. Cornhill Pub. Co., Boston. 240 pages. Price, $4.50.

The author's extensive and successful experience in telephone valuation and rate making qualify him for the able treatment of the subject revealed in this timely and valuable volume. Mr. McKay has the happy faculty of handling technical subjects in a workable manner, and for this reason his book probably will find a busy place in the telephone man's library.

Chapter titles give a good indication of the scope of the work. They are: Commission Form of Public Utility Regulation; Appraisal Terms; Determination of Fair Value; Direct Construction Costs; Collateral Construction Costs; Non-physical Assets; Preliminary Steps of Inventory; Inventory of Real Estate and Equipment; Otside Plant Inventory; Inventory of Miscellaneous Equipment; Preliminary Discussion of Unit Costs; Unit Costs for Real Estate and Equipment; Unit Costs for Pole Lines; Unit Costs for the Aerial Cable Plant; Outside Wire Costs; Conduit Costs; Underground Cable Costs; Miscellaneous Unit Costs; Depreciation; Function of the Appraisal in Rate Making; Telephone Appraisement by Short Methods.

AUTOMATIC TELEPHONE SYSTEMS (Vol. 1), by William Aitken, Benn Bros., Ltd., 8 Bouverie St., E. C. 4, London, Eng. 282 pages. Price, 25/ net.

Although a British production, the first volume of this treatise on automatic telephone is international in its treatment of the various systems and in its interest. The author is a competent authority, and was responsible for "Manual of the Telephone" which has been well received.

It is the purpose of this book to present all phases of automatic telephony in such a manner that they will be understandable to those having a working knowledge of electricity. In this connection it makes especially good use of large diagrams which have the circuits numbered so they may be plainly traced.

The material is compiled so it may be readily edited as the status of its subject matter changes through improvement or failure to become established by performance.

By handling the contents in sections instead of in chapters the author treats of one feature or a system, as the subject warrants.

OPINIONS AND COMMENTS

TOO LATE?

It's not supposed to be good newspaper practice to run editorial opinions in straight news matter, but that doesn't make any difference in White Hall, Ill., where the Register, a representative and rather good little journal is published.

Here is what the Register says about a request for a rate increase made by the local telephone company which has just bought out the Bell interests in its territory:

"The company may deserve some increase but it seems that they are rather late in the day in asking for an increase now when the tendency of practically all prices are downward. If they weathered the storm the past two or three years at the present rates everything was 'sky high', they ought to be able now to continue business and make money from now on. The service could be materially improved. We are perfectly willing to pay for improvements but not for extra dividends."

Good for you, brother, you "are perfectly willing to pay for improvements." Well, that is just what the increases telephone companies are requesting, are to bring you. You may rest assured that preservation of present dividends, if any, is a much more pressing subject with telephone companies than the faint hope of any "extras".

Forget this business of "weathering the storm the past two or three years". The storm was just barely weathered, and that's all. Most of the crew are limp from manning the pumps and need the help of increased rates in calking the weather beaten craft.

"Rather late in the day to ask for an increase?" A whole lot better late than never, and the utility certainly has some credit due it for standing the buffeting alone this long, rather than facing you with a record of having done its getting while the getting was good.

SLINGO'S LESSONS.

English telephone men are talking about Sir William Slingo these days.

Sir William was Engineer-in-Chief of the Post Office, until he was released on account of "old age." He had fought a valiant battle against red tape in trying to reorganize government telephone service.

To show that the British government service regulation "old age" meant nothing to him, Sir William went to Peru, at the Peruvian government's request, and was given a free hand in reorganizing the communication facilities of that country.

Peru now is getting A1 wire service.

It seems that this incident is not without its effect in England. Now, it looks that though government officials, they are getting an idea of the value of unrestricted personal initiative and are beginning to see that a man is only as old as he feels.

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ADVERTISING

TELEPHONE ENGINEER is issued the 15th of each month. Copy can be accepted as late as the 10th of the month preceding date of publication. Where proof must be seen, allow ample time for transmission in the mails. Display Advertising—Rates on application. Classified Advertising—"Wants," "For Sales," etc.—$4 an inch, or 7 cents a word per insertion.

A WORLD REMADE

Hiram P. Maxim, the inventor, at a radio convention, forecasts the day when congress will meet by telephone, when the frontier families will sit and hear, via loud speaking telephone, addresses by noted men and women, and music now denied them.

He paints a picture of a new world—a world remade by the telephone.

If Maxim were simply a dreamer, his statements would pass unheeded. But he is a hard headed, practical business man, gifted with foresight.

Already the telephone is hard at work remaking the world. We have passed the threshhold of the new era. Lack of communication facilities is being given a remedy.

A statistician says even the the figures of bygone "panic times" show that business at its worst was never below 80% of normal. This leaves a margin assuring survival to the workers and thinkers of business.

An advertising man connected with a great journal says the telephone company's advertising is the most interesting his paper carries. Why shouldn't it be? Is there another business so intimately concerned with the daily life of any community?

Those telephone companies which now enjoy fair rates should make every effort to merit their continuance. The surest way is to please the public with good service and courtesies.

NEWS FROM FOREIGN LINES

SPAIN PUZZLED

B. G. Hubbell Tells of Situation Arising from Government and Private Ownership Dispute

Buffalo, N. Y.—B. G. Hubbell, president of the Federal Telephone & Telegraph company, has recently returned from an extended trip abroad. In discussing some features of the trip his explanation of the telephone situation in Spain was especially interesting.

It seems that in the early stage of telephony in that country the government made contracts with private companies to install telephone systems in the large cities, notably Barcelona and Madrid, and that these contracts provided that at the expiration of a certain number of years the government would have an option to take over these companies as its own without payment to the private companies, the thought being that these private companies could make enough out of the operation so they would, during this period of time, receive full pay for their properties. These options are now maturing, and the problem at the moment in Spain is whether or not the government wishes to enter into the telephone business and exercise these options by taking over these telephone properties. The privately owned companies find themselves in position where they are likely to lose the control of their properties, and as they have been unable during the period of operation to secure a return of their investment, they are very loth to give them up. This controversy is now very active, and until the government decides whether or not to take advantage of its rights under its contracts and take over these companies, a considerable extension of telephone service will not be made.

Spain is a country of approximately 21,000,000 people, and there are less than 75,000 telephones in the entire country.

Madrid instead of being the old, dilapidated city which we, in America, think it is, because of the old songs we used to sing about it, and also our general conception of Spanish countries, is a remarkably well built city. During the past few years Madrid has probably spent a greater amount of money for new buildings than any other city in Europe. Its public buildings are very wonderful and its apartment houses and office buildings are extraordinarily well built. Its hotels surpass anything in Europe. But, with all of this advancement there are less than 5,000 telephones in this city of a million people, and these telephones, strange as it may seem to us all are almost entirely magneto.

What Mr. Hubbell has just said of Madrid, he says also is true of Barcelona, which is relatively in the same position. It is a marvelous city of approximately one million people but has no more telephones or better service than Madrid.

Many of the small communities in Spain have no telephones at all, and the smaller cities are limited to practically no local service, telephones being used in these smaller places only for long distance.

A decision of the government may be expected within a short time relative to taking over these telephone plants, and out of it, no doubt, will come a determination on the part of the government either to enter actively into the telephone business or to give liberal concessions to the present companies to extend their lines, and either plan will bring a revival of telephone construction and uses.

From a telephone man's point of view, the woeful lack of telephone use in Spain, particularly in these two largest and most modern cities, as compared with the completeness of the building development of those two cities, is the most astonishing thing found in Europe.

France to Boom From Union of Thomson-Houston and W. E.

Paris, France.—An arrangement has been effected between the Compagnie Francaise Thompson-Houston and the Western Electric company which is expected to greatly facilitate telephone development in France.

Peter Cooper Hewitt Dies —Telephone Inventor.

Paris, France. — Peter Cooper Hewitt died here, August 25th. He was responsible for many notable inventions, among them telephone relays and electric wave amplifiers. He was born in New York City, March 5, 1861.

Shortage of Telephones Stirs Great Britain.

London, Eng. — Postmaster-general Kellaway, in a recent report to the government said: "There was a great shortage of exchanges, and although new ones were springing up, a great number more were wanted, and the Government hoped to make considerable improvement if it got the £5,000,000 asked for. Recounting the progress made in laying underground trunk lines, he said that the three largest roads which were now approaching completion were (1) London to Manchester, which would be completed near the end of this calendar year; (2) London to Bristol and thence to Newport and Cardiff; and (3) London to Southampton with a spur to Portsmouth. The number of rural call offices opened in 1919 was 149; in 1920 it was 383, and in the first quarter of this year 116 had been opened and 105 were in course of construction. Arrangements were being made to open call offices at rural post offices where there was a telegraph line that could be converted to telephone purposes and a reasonable probability of business being done. On the question of the new telephone tariff, he said that the number of subscribers who, as the result, had surrendered their telephones, was 23,000, 47 per cent of the total number. During this time they had accepted 27,000 new subscribers, and had had to refuse 23,000. The bulk of the complaints he had received about the service related to the difficulty which those who desired to have the telephone installed found in getting it installed."

New French Stunt to Harness Submarine Cables.

Paris, France.—MM. Gaston Vincent and Louis Duverger, have invented equipment for using present submarine cables for telephone service. Experiments are to be made on the 125 mile line between Antibes and Saint Florent, Corsica. This line, is in a state of disrepair, having been out of telegraphic service for some time, but the inventors of the new system are willing to let the reputation of their idea rise or fall on its performance on the old cable.

Loading Lines Correctly

How Leading Telephone Engineers Have Solved the Problems of Loading without Irregularities—Coil and Condenser Location and Performance Described

By W. N. Furthman

Irregularities in a loading section are so objectionable to good transmission that the advantages of the use of loading coils are almost totally destroyed. In addition to increasing the attentuation of the circuit irregularities in the loading of a circuit reflectional losses are also brought about. The principal objection, however, especially in phantom circuits, is the introduction of a harmful amount of crosstalk.

In a previous issue of TELEPHONE ENGINEER, the necessity of artificial lines was discussed in two-way repeater circuits. In that article it was pointed out that a repeater system could not be installed without the use of artificial lines. Irregularities in the loading of a section make it very difficult to balance the line impedance with an artificial circuit and since this is one of the most important elements in a repeater system it will be self evident that the irregularities caused by poor loading affect one of the most important elements in a long distance loaded line.

Locating Irregularities.

These irregularities may be traced either to defective loading coils or to line conditions. Line irregularities may be due to differences in the actual length of a loaded section, that is the distance between consecutive loading coils, or may be due to different distributed line constants in the conductors of the different sections.

A repeater system is generally added to a loaded line system, thus becoming excessive either in length or in miles of loaded cable of which the circuit may be a part. Under the best conditions it is considered quite a problem to add the repeater system to a loaded section and one of the hardest parts of this problem is the correction of the irregularities in a loaded system which were not apparent until a repeater system was added to the circuit. Correction of such irregularities, it will be clear, in a long system may be so expensive as to be impractical. It is therefore desirable that means be at hand for rendering the loaded sections electrically uniform and equal without its being necessary to reconstruct in a physical manner either those defective sections of the line or the re-location of defective loading coils. In considering a loading coil from an inductance and capacity standpoint, it will be evident that its fundamental value may be destroyed by magnetization, and that in order to restore its lost value means must be provided in a simple manner for recovering this loss. It has been determined that the total electrostatic capacity of a loaded section may be made equal by the introduction of condensers between conductors of sections having a defect of capacity and that the line may be made electrically like a uniform line and all of the previous advantages of uniformity may be obtained in this manner.

When it is remembered that the loading sections are electrically short, in this country every 1.4 miles and in England 2.5 it will be clear that the distributed inductance of each line section is small compared with the inductance of a loading coil, so that these irregularities appear in practice

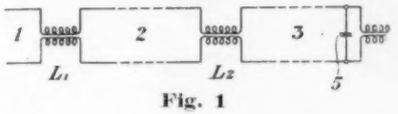

Fig. 1

as differences in line capacity per loading section. It will be self evident, therefore that if the capacities of the different loading sections are made equal the line will respond electrically

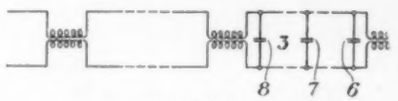

Fig. 2

like a uniformly loaded line, although the various sections may differ widely in physical length and distributed constants. By inserting condensers in irregular sections electrical uniformity of loading is provided by proportioning their value with reference to the capacity of the normal section and the irregular section so that the resultant capacity of the irregular section is equal to that of the normal section.

Loading Diagrams.

Referring to Fig. 1, a diagram of a loaded transmission line with equalizing condensers inserted in the irregular section; Fig. 2 is a diagram of a loaded transmission line with a plurality of equalizing means inserted in an irregular section; Fig. 3 is a diagram of a cross section of a four wire phantom system which shows the method of connecting the equalizing condensers in an irregular section of a phantom system.

Referring to Fig. 1 a transmission line is shown consisting of loading sections 1, 2 and 3, the adjacent sections being connected by loading coils L_1, L_2. It will be assumed that the measured capacities of sections 1, 2 and 3 are all equal to C which may be taken as normal capacity per loading section of the line. Assuming, however, that the capacity, measured or computed, of section 3 is C' where C' is less than C; then, a condenser 5 is connected between two conductors of section 3, the capacity of condenser being C—C', that is the capacity of the condenser is equal to the defect in capacity of the section in which it is connected.

It will be understood that the equalizing condenser may be profitably inserted to increase the capacity of an irregular section whether the defect of capacity in the irregular section is due to a short loading section or to a defect in the distributed line capacity of the irregular section. Since the capacity of condenser 5 is necessarily positive it will be seen that the equalizing condenser may only be employed when there is a defect rather than an excess of capacity of the irregular section. When there are a large number of irregular sections in the line it may be desirable to select that of the largest capacity as the normal section and insert equalizing condensers in all the other sections. If the irregularities are due to a few long sections, that is sections having an excess of distributed capacity these long sections may be converted into short sections by the insertion of additional loading coils and the consequent defect of capacity corrected by the condensers. It will be seen, therefore, that this method of correcting irregularities in the loaded section is not limited to irregularities due to the defect of capacity in one or more sec-

tions, but may be extended to the correction of irregularities due to excessive capacity in one or more sections.

Condenser Location.

In Fig. 1, a single equalizing condenser is shown. It is, of course, understood that a single condenser does not exactly represent the effect of a distributed capacity of a line section. Provided very high precision is required a plurality of condensers may be inserted in the irregular section as shown in Fig. 2. The arrangement in Fig. 2 does not differ from that in Fig. 1, except that in the arrangement of Fig. 2 the plurality of equalizing condensers is inserted in section 3. In this figure the three condensers 6, 7 and 8 are shown, condensers 6 and 8 being inserted near the ends of section 3, while condenser 7 is inserted near the middle of section 3. The total capacity of the three condensers should be approximately equal to the defect in capacity of section 3. Figs. 1 and 2 show the equalizing condensers as inserted in a loaded transmission line, consisting of two parallel conductors. In phantom loaded systems where four parallel lines serve as conductors for two side circuits and the phantom circuit, it will be evident that a more complicated system of neutralizing condensers is necessary. In a phantom system it is necessary that provision be made for inserting equalizing capacities in side circuits and phantom circuits without causing interference or crosstalk. Fig. 3 is a diagram illustrating the method of inserting equalizing condensers in a phantom system. Referring to Fig. 3, the cross sections of the four wires composing the conductors of a phantom loaded system are illustrated by 11, 12, 13 and 14, cross section being assumed as taken in an irregular loading section in which there is a defect of capacity both as regards the side circuits and the phantom circuit. Conductors 11 and 12 constitute the two conductors of one side circuit and in parallel one side of the phantom circuit and conductors 13 and 14 constitute the two conductors of either side circuit and in parallel the other side of the phantom circuit. Condensers are connected between conductors 11 and 13, 11 and 14, 12 and 13 and 12 and 14, said condensers being similar and equal. Between conductors 11 and 12 is connected condenser 16; between conductors 13 and 14 is connected a similar and equal condenser. In the phantom circuit conductors 11 and 12 are in parallel constituting one side while conductors 13 and 14 are in parallel constituting the other side of the phantom circuit. The capacity as regards the phantom circuit due to the inserted condensers is clearly evident to be $4C_a$ where C_a is the capacity of each condenser 15. As regards each side circuit it will be readily seen that the capacity between 11 and 12 or between conductors 13 and 14 is C_a plus C_b where C_b is the capacity of each condenser 16. Let

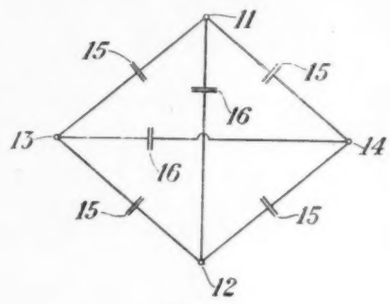

Fig. 3

C_p be the capacity between the sides of the phantom circuit of the normal section and C_p' for the irregular section. Let C_s be the capacity between the conductors of the side circuit of

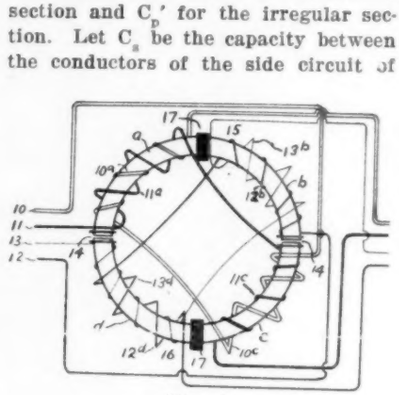

Fig. 4

the normal section and C_s' for the irregular section, then the values of the equalizing capacity are determined by

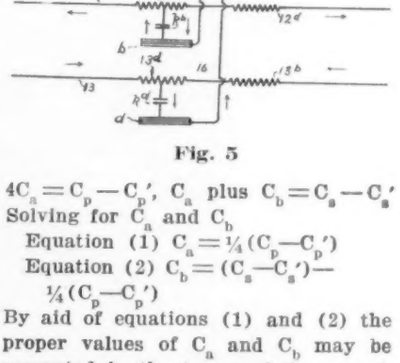

Fig. 5

$4C_a = C_p - C_p'$, C_a plus $C_b = C_s - C_s'$
Solving for C_a and C_b

Equation (1) $C_a = \frac{1}{4}(C_p - C_p')$

Equation (2) $C_b = (C_s - C_s') - \frac{1}{4}(C_p - C_p')$

By aid of equations (1) and (2) the proper values of C_a and C_b may be computed in the terms of the capacities of the sides and phantom circuits of the regular and irregular loading sections.

Shielded Loading Coil.

Fig. 4 shows a phantom loading coil having its core and winding sections arranged with air gaps. Fig. 5 is an illustration of the distribution of capacities between the windings and core in such a coil. Fig. 6 is another view showing the path of crosstalk current when shields are applied to the core; Fig. 7 is an enlarged transverse section through one side of the coil with the outer winding omitted; Fig. 8 shows in elevation the core of the coil with the electrostatic shields; Fig. 9 shows the space relation between the ends of the groups of winding-sections in the coil of Fig. 4.

Fig. 4 is a phantom loading coil as shown, having a pair of windings for insertion in conductors 10, 11, 12 and 13 of each of two physical telephone circuits. The iron core of this coil is, as shown in the figures, of the usual torroidal form and is divided at 14, 14 by air gaps occupied by non-magnetic material. Upon the sections 15 and 16 of the core thus formed the line windings are arranged in sections, there being two sections for each line winding situated on opposite quadrants of the core a, b, c and d, each extending from a point in proximity to one of the gaps 14 to a point adjacent to the center of the core section. To prevent electromagnetic crosstalk in the coil between the two physical circuits the windings included in the circuits must be electromagnetically balanced and this requires that the mutual impedances between the winding sections separated by the core gaps shall be equal to the mutual impedances between those on the same section. In the manufacture of loading coils having a plural section cores it is necessary to leave a space between the windings to allow for cutting the core; and between the gaps in a two-section core coil carrying four groups of winding sections. The windings are put as closely together as will be consistent with the requirements of the dielectric strength of the coil and still produce a winding space which is as small as possible. The use of these air gaps and the separation of the windings at these points causes considerable magnetic leakage, bring about mutual impedance unbalances between the windings and thus resulting in crosstalk. Provided the leakage at the extremities of the winding sections is equalized and the electromagnetic balance of the section obtained crosstalk from this source becomes a negligible quantity. The method of obtaining these slots and still retaining the balance of the coil is as follows. The ends of the winding sections at opposite sides of the

gaps are brought closely together, leaving sufficient space to cut through the core without injuring the windings and in a standard loaded coil this separation between the windings may be as little as one eighth of an inch. At ninety degrees from the air gaps the opposite extremities of the windings are separated at 17 by one eighth to one quarter inch, thus creating poles which have similar leakage effects to the core gaps.

Cross-talk Problem.

The use of two core gaps, unless means are taken to prevent it, will lead to electrostatic crosstalk between the side circuits by way of the capacities, ka, kb, kc and kd between the inner layers of the winding sections which are next to the core and core sections. The distribution of these windings to core admittances appears in Fig. 5. From this figure it will be seen that ka and kb are associated with the core section 15 and kc and kd with the other section. The circuit 10, 11 is considered as the disturbing side circuit, the flow of current being indicated by the long arrows. The path for crosstalk shown by the short arrows is as follows: From conductor 10 by way of the winding section 10a through capacity ka, the core quadrants a and b and capacity kb to the winding section 12b where the current divides and flows in opposite directions through the conductor 12 of the disturbed side circuit, back over to other conductor 13 of the side circuit to the winding section 13d through the capacity kd, quadrants d and c and capacity kc to the winding section 11c and the conductor 11 of the disturbing side circuit.

Disturbing current will flow in the circuit indicated because capacities ka and kc are associated with the opposite conductors of the same side circuit, thus having its full potential acted upon. This crosstalk may be eliminated by applying to each core section an electrostatic shield 21 shown in Figs. 7 and 8, conductively connecting these at 22. The shields may consist of thin metallic sheets such as copper netting or tinfoil wrapped about the core section with the adjacent edges extending the circumference of the core. These edges should be separated or insulated from one another at 23 so that they shall not furnish closed electric circuit about the core, thus bringing about a short circuited secondary winding. The connections 22 must be of non magnetic metal to avoid short circuiting the gaps in the core and is soldered to the shields at each extremity. The low resistance connections between the shields shortcircuit the high impedance crosstalk paths in the manner shown by the short arrows in Fig. 6.

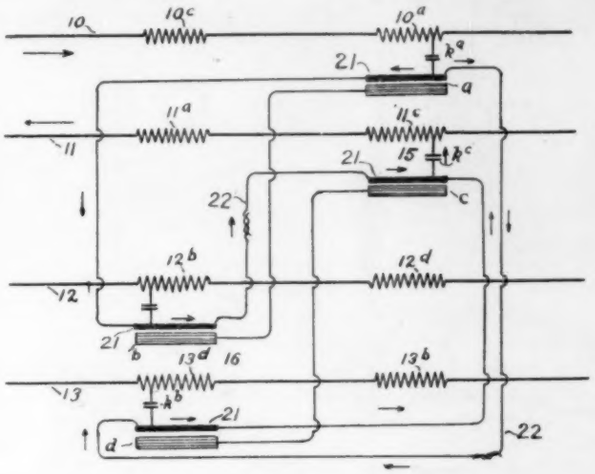

Fig. 6

The writer has found by experiments that this method of shielding a loading coil is somewhat expensive and may

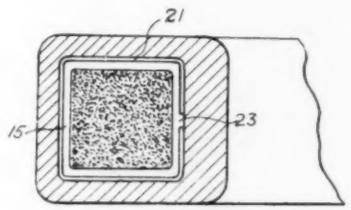

Fig. 7

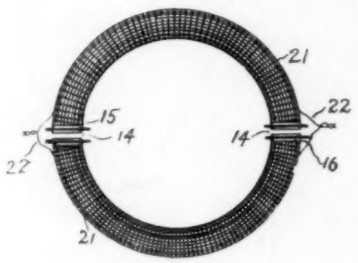

Fig. 8

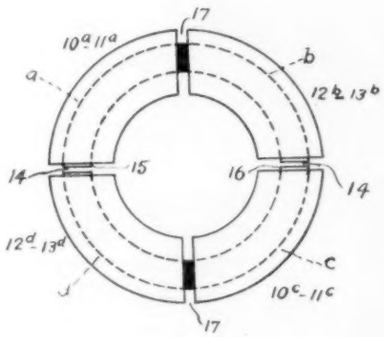

Fig. 9

be entirely eliminated provided the sections of the coils are properly balanced for inductance, capacity and resistance. This balancing of the sections of the coil, while not a laboratory operation in its manufacture, requires the use of a balancing alloy wire that has the specific resistance of German silver and the same temperature coefficient as the copper wire which is used in winding the coil.

The air gaps in a loading coil are required in order to insure that the inductance of each section of the coil will always be the same as the inductance in the other sections. They are absolutely essential because it will be readily apparent that outside magnetic disturbances such as lightning would bring about a difference of inductance in the sections, thus producing crosstalk in the circuit, as explained. Testing of the circuit with an excessive amount of direct current will also bring about a similar condition. By means of an air gap in the coil both of these causes of a large amount of crosstalk are permanently overcome.

Improved Type of Loading Coil for Aerial and Cable Circuits.

Fig. 10 represents a circuit diagram of two physical circuits and a phantom circuit including loading unit. Fig. 11 is a view of the magnetic structure of the loading unit. Referring to Fig. 10, 1 and 2 represent two physical circuits which are loaded by including in them inductance coils with windings mounted on the semi-torroidal cores 3 and 4. No. 5 is a phantom circuit derived as usual by employing line conductors of each physical circuit in parallel as one effective conductor of the phantom circuit.

In the magnetic structure 6 represents a gap or an equivalent break in the magnetic circuit, formed in this instance, by a suitable non magnetic material which is, of course, non-conducting, to avoid loss of energy in the

eddy currents. In Fig. 11 the two loading coil cores are placed one above the other. No. 6 represents a strip of separating material described, in connection with Nos. 1 and 7 yokes of magnetic material. These yokes of magnetic material are made out of

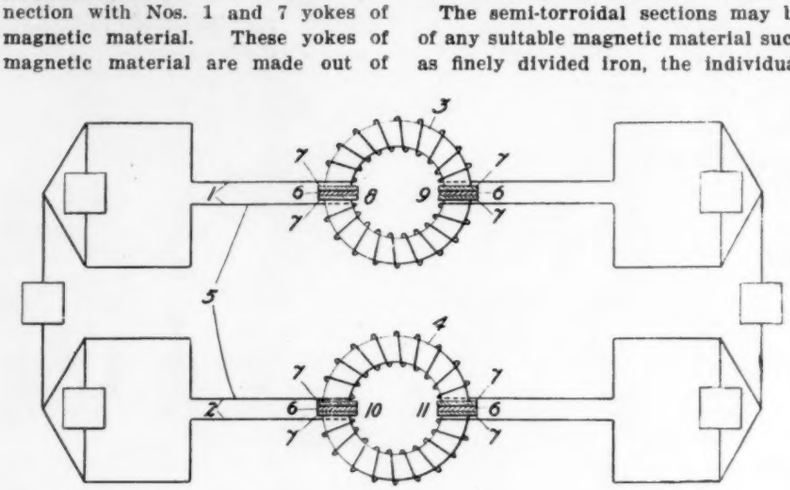

Fig. 10

laminated iron in order to form a low reluctance magnetic bridge to connect the cores of the inductance coils. These magnetic bridges 7 are indicated in both figures by the same number.

When the currents flow in opposite directions in the two conductors of the physical circuit No. 1, a magnetic flux is produced which lies in a circular path around the core shown as No. 3. The windings, however, are so arranged that when currents in the conductors of circuit 1 flow in the same direction, as would be the case in phantom operation of the circuit, north and south magnetic poles will be produced at 8 and 9 respectively and at the same time south and north magnetic poles will be obtained at points 10 and 11. As a result of this magnetic condition the lines of the phantom circuit flux will lie in the two halves of cores 3 and 4 in parallel and will be completed in the magnetic bridges 7. In the first instance, that of the physical side circuit, the flux will be linked with the physical circuits only and in the second case with the phantom circuit only, therefore the operation of these circuits will be independent.

In loading a phantom circuit it has been found that a method which depends solely upon employing a leakage field is subjected to the objection that it is difficult to secure a phantom circuit that has sufficiently high inductance for a given physical circuit, and it has also been found that when loading coils are manufactured without air gaps the desired inductance which is obtained may be destroyed by heavy currents. Provided both of these results may be obtained for increasing the reluctance of the paths traversed by the physical or side circuit to any desired value without increasing the reluctance of the paths traversed by the phantom circuit flux, it will be evident that a desirable result is obtained.

The semi-torroidal sections may be of any suitable magnetic material such as finely divided iron, the individual

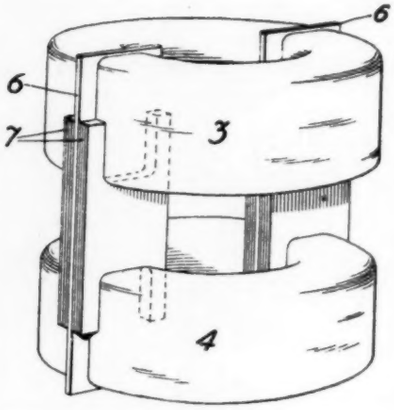

Fig. 11

parts of which are connected with a thin insulating film, the core structure being formed under high pressure.

Improved Method of Winding Loading Coils for Telephone Lines.

It is the present practice to wind physical side circuit coils in two sections, each section composed of an inner and outer winding and a phantom coil in four sections. Each line conductor of the coil includes serially the inner and outer windings respectively of opposite core sections. With either of these coils, especially the phantom coil there is a magnetic field external to the coil when opposing currents flow in the winding of a given core section. This is due to the fact that the outer windings exert a stronger external magnetizing force than the inner one. The resulting external magnetic field due to opposing currents in the two windings acts in part upon the iron case surrounding the coil, and spends itself to a certain extent in eddy currents and hysteresis losses which react on the coil and impair its efficiency. It is possible to minimize these losses without air gaps in the core by giving each inner winding a sufficient number of turns with respect to the outer winding on the same section so that the magnetizing force of the inner winding is increased. The magnetic field due to the opposing currents in the two windings is reduced to a minimum in the regions external to the coil. In other words this stray magnetic field is driven to the core of the coil where it can dissipate very little energy, instead of being allowed to spend itself in the non-laminated iron of the case.

Fig. 12 is a representation of the core and windings of 3 loading coils for a phantom telephone system including two side circuits and one phantom coil; Fig. 13 is a simplified diagram of a four-conductor phantom telephone line system loaded with side and phantom circuit coils; Figs. 14 and 15 are diagram drawings each showing part of a phantom loaded coil in cross

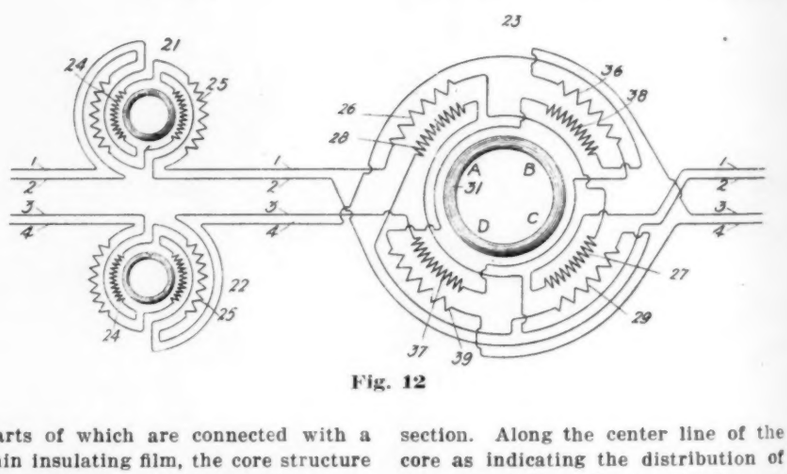

Fig. 12

section. Along the center line of the core as indicating the distribution of the magnetic lines, due to opposing currents in the winding of one quarter section; Fig. 14 indicating the stray field with an ordinary phantom coil and Fig. 15 the stray field in a coil constructed as described above.

Referring to Fig. 13, the four conductors 1, 2, 3 and 4 of a long distance

telephone system are shown connected for phantom circuiting at one end through repeating coils 5, 6, and 7 to three telephone stations 8, 9 and 10 and at the other end through repeating coils 11, 12 and 13 to three other stations 14, 15 and 16. Loading coils are provided, two of the groups 17 and 18 being indicated in the diagram and comprising two side circuit loading coils 21 and 22 and one phantom loading coil 23.

Each line conductor includes at each group of coils in series two sectional windings 24 and 25 on a side circuit coil and two sectional windings 26, 27 on a phantom coil. The two sectional windings 26 and 27 comprising one line winding element of the phantom coil are as indicated in Fig. 12 an outer and an inner winding, respectively of opposite core sections A and C, each covering approximately one quarter core section. For phantom circuit work the direction of the currents in windings 26 and 27, included in line conductor 1 and likewise in windings 28, 29, 36, 37, 38 and 39 included in line conductors 2, 3 and 4, is such that the magnetizing forces are cumulative, all tending to produce a magnetic flux in the same circular direction in the core providing the coil with its proper inductance. In the side circuit part of the system the currents found in the windings of the coil tend to produce opposite magnetic forces so that the inductance is very small. In this case however there will be a resultant stray field occupying the small space 32 shown in Figs. 14 and 15 between these windings starting at or near their ends 33, 34 and returning by way of the core 31 and by way of the space including the iron case 40 external to the coil. It is this external field of force due to opposing currents in the inner and outer windings that causes the eddy currents loss in the case and outer winding conductors. As shown in Fig. 14, when the outer and inner windings have an equal number of turns the magnetizing force of the outer winding is the greatest in the space external to the coil and the greatest number of stray magnetic lines of force, indicated by the curved lines, interlink with the case. These external stray magnetic forces can be reduced by giving to the inner windings a greater number of turns than the outer windings, thus making the inner winding which is nearer the core the greater magnetizing force and diverting the greater part of the stray field to the core. The distribution of the lines of force is indicated in Fig. 15. It has been found in certain coils that the magnetic fields due to the opposing currents in the windings are reduced to a minimum in the space external to the coil when the inner winding has 10% more turns than the outer winding. This percentage of turns, however, depends upon the design of the coil and the type which is to be used and the proper ratio for each type of coil can be determined by varying the turns of the inner or outer winding until the external magnetic forces are reduced to a minimum.

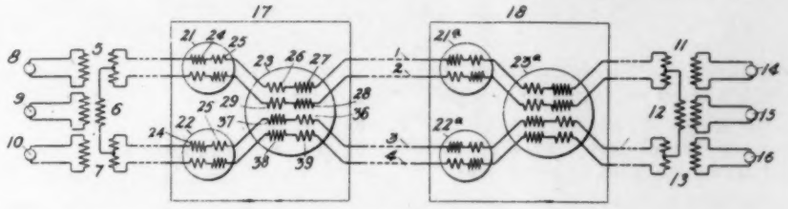

Fig. 13

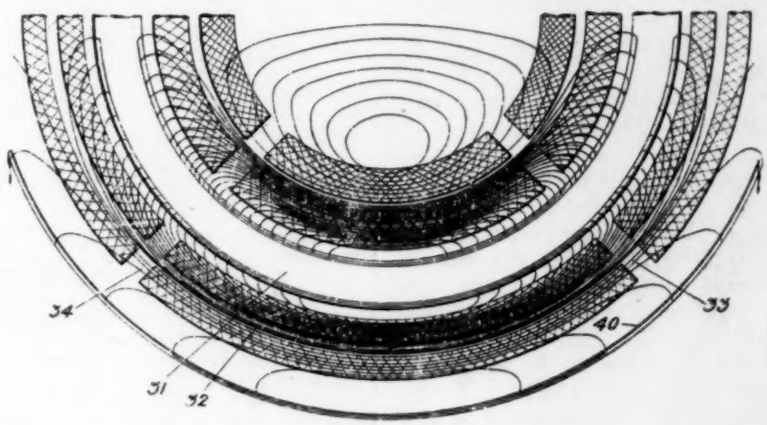

Fig. 14

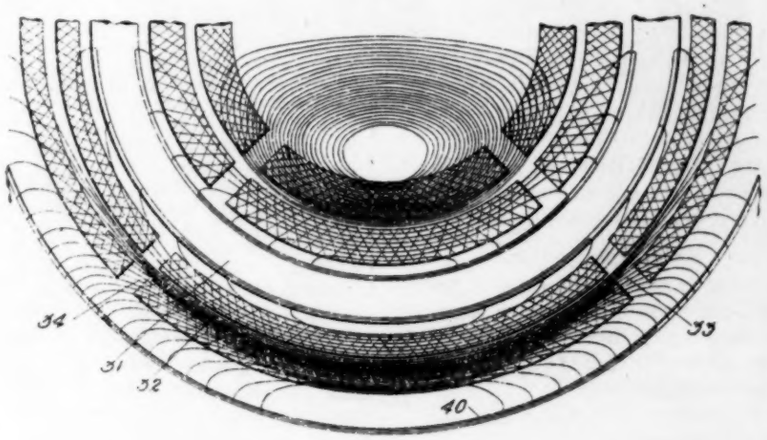

Fig. 15

Burnham Issues 1921 Manual of Mid-Western Securities.

Chicago, Ill.—John Burnham and company, have issued the 1921 edition of Burnham's Manual of Mid-Western Securities. Public utilities securities, those of banks and of industrial corporations are described.

Speedy Service of Crook Call Prevents Pay Box Theft.

Lima, Oh.—An alarm registered on the switchboard of the Lima Telephone company enabled the police to catch red-handed a youth in the act of rifling a telephone pay station box in a local railroad station.

Eugene, Ore., Plant to Bloom $50,000 Worth.

Eugene, Ore.—Pacific Telephone and Telegraph company is to spend $50,000 in making plant improvements in this city, according to C. P. Van Houtte, manager. Extensive line work is to be done.

Mocks Junkman With Thrift

Big Telephone Manufacturing Company Operates in Reclaiming "Waste Products" So $60,000 is Saved—A Money Medley of Scents and Cents

Chicago, Ill.—The cry, "Rags, Old Iron," falls on deaf ears at the Hawthorne plant of the Western Electric company these days. In fact since 1909 when the utilization of "waste" products from the great telephone plant was made the subject of the intensive study that has brought about the present thorough recovery of materials, John the Junkman, has cut Hawthorne off his beat.

From the first sale of one gross of overstock brass butts at a worthwhile gain over their junk value, the application of market preparation and selection methods to the formerly "junked" waste of the Hawthorne plant has developed an income of about $60,000 a year more than the junk price of the material.

Some of the many interesting details of this recovery business are told by Mr. Hullihan of the Hawthorne special sales department, in the Western Electric News. Mr. Hullihan writes:

"Here are a few of the things we dispose of: Copper, lead, tin, antimony, cadmium, spelter, nickel, aluminum, brass, bronze, brass turnings, shoveling steel, hydraulic bales of stamping steel, fabricated steel, heavy steel, cast iron, cast iron borings, miscellaneous hard and soft rubbers, rags, yarns, wool clips, silk floss, spun silk, waste paper, paints, varnishes, japans, lacquers, oils, etc., to a total value of about one and a half million dollars a year in normal times.

Helps Vanity Fair.

"And let's not forget hepta-aldehyde. Hepta-aldehyde is used as a perfumery base. It is one of our chemical residues and commands $10 a pound on the market.

"But our by-products department's service to my lady fair does not end with supplying her with sweet scents. Long may she wave, say we, and to help make her wave as nearly permanent as may be, we sell our No. 19 braided interior telephone wire to the manufacturer of a well-known brand of hair curlers. This is cut to size, covered with a piece of sleeving, supplied with a pretty label and sold at a very nice margin of profit. Incidentally, our sale of 'the makings' nets us a substantially larger amount than we would realize by burning off the insulation and reclaiming the copper.

"To make amends for the thousands of guileless males who have fallen victims to the wiles of our cast-off wire in the form of hair Pickfordizers, we have succeeded in placing some wire where it operates to save men. During the 'flu' epidemic electric heating pads were used with such great success that the demand reached unprecedented proportions. Our special sales department used this opportunity to sell many tons of soiled, acid-stained and junked telephone cords, taken from returned apparatus and other sources. These were baled and sold to heating pad manufacturers, who slipped off the outer green cover, dyed the braiding beneath and used these reclaimed cords while it was impossible for them to buy new cordage. Again quoting the profits, the cords for that use brought several times their junk value.

Makes Canned Music.

"Another of our waste products that has a peculiar destination is what we call 'shellac composition,' which is used in making various insulators, as well as some types of telephone mouthpieces. We re-use most of that kind of scrap ourselves but occasionally we have a surplus with no immediate use for it and it has to be sold because some one needs the storage space for more valuable material. This happened recently, and how do you suppose our by-products people disposed of the material? I'll betcha ye dinna know, as Harry Lauder says. Well, that should give you a hint. They sold it to a manufacturer of phonograph records.

The Big Sellers.

"Now for some of the big sellers:

"Hawthorne's machines trim off about 1,600,000 pounds of yellow brass turnings every year. These turnings as gathered in the shops are mixed with oil and with minute quantities of iron and steel turnings. A centrifugal machine removes the oil in short order, and a magnetic separator takes out the iron and steel contents. We use great care to keep out aluminum, babbitt, etc., especially aluminum, which depreciates the value of this grade of brass more than any other foreign material. Consequently, Hawthorne brass turnings are of a very desirable grade and are more easily disposed of than any other junk item, not even excepting copper scrap. Most of our brass turnings are returned to our brass suppliers, but occasionally they are overstocked and we then sell in the open market. We have just shipped 150,000 pounds to a manufacturing concern that uses them directly in their crucibles in place of brass ingots, thus saving on the original cost and also on the cost of melting, since turnings melt more easily than ingots. That shows the high grade of our turnings, as no firm could otherwise take the chance of having their prod-

OUR INDUSTRY.

Beginning less than 50 years ago, the telephone business has grown until we now have in this country 14,000,000 telephones owned and operated by 53,000 telephone organizations. Their lines approximate 29,000,000 miles of wire which are centered in 22,000 telephone exchanges; a sufficient amount of wire to go around the earth at the equator nearly 1,200 times.

These 14,000,000 telephones representing more than 70 per cent of all the telephones in the world are used for communication at the rate of 22,000,000,000 times a year. These days we speak of millions and billions as a matter of course, ofttimes giving little or no thought to what they mean. If, however, we compute the elapsed minutes from the present, back through the years and the centuries to the birth of Christ, we find that only slightly over one billion minutes have elapsed and yet the telephone using public in this country talk 22 times that amount each year. The demand for additional telephone service is adding upwards of 750,000 stations each year to the 14,000,000 now in operation. The present investment is approximately $2,000,000,000. These statements enable us to imagine something of the bigness of this industry in which we are engaged.

W. S. VIVIAN.

uct ruined through foreign matter in the brass.

"Most of our rod, sheet and tube brass scrap (which amounts to 2,500,000 pounds a year) is also disposed of to our regular brass suppliers.

"Nickel-plated brass scrap presents an additional problem. Dealers will not buy it except at a price considerably below the market figure for unplated brass. Consequently, we give it a bath and strip it (a reversal of the usual order). As we use acid instead of water, we have no trouble getting its coat off in a hurry. After that it is just ordinary brass and sells readily as such. We do the same thing with nickeled scrap red brass from our own foundry. It is then a simple matter to prepare it for recasting by adding whatever of the ingredients are necessary to bring it up to specification.

"Copper magnet-wire is another big scrap item at Hawthorne. This comprises silk, cotton and black enamel insulated wire and runs into a total of some 800,000 pounds yearly. It is a very desirable material and commands a good price. Of course, shrewd purchasers of this wire have some rather startling figures to show the loss of copper in oxidization when the insulation is burned off, as well as some novel ideas on the specific gravity of various insulating materials, but by knowing a few things on that subject ourselves we are usually able to induce them to admit that there may be a minor error of perhaps 80 per cent or so.

"Although the bulk of our magnet wire is sold to firms reclaiming the copper we have also worked up quite a special market for a large tonnage of it wound on magnets or repeating coils. We sell the entire assembly to manufacturing plants, to be used in the manufacture of transformers and other swell electrical apparatus.

"Some other classes of apparatus are also sold without disassembling in cases where it would not pay to tear the parts down. Among these are generator armatures, jack frames, magnet spools, receiver coils, etc. These parts are sold to smelters, who only figure on recovering the copper contents in melting them up.

"Another of our big quantity scrap materials is galvanized iron, of which we handle some 800,000 pounds a year. During the war this grade of scrap brought a good price, but it is now almost unsalable. We segregate the usable pieces, such as strips and shearings, and dispose of them by special sales, principally to toy transformer manufacturers. The only use that can be found for the rest of it is to sell it to sash weight manufacturers, who can use a very inferior metal in their castings. However, when spelter is selling at high prices, we can get a good price for galvanized scrap from detinning companies.

"Hawthorne also produces an enormous amount of ungalvanized steel scrap in a form that we call 'skelton steel scrap.' It consists of the waste parts of strips from which various piece parts have been stamped by Hawthorne's numerous and voracious punch presses. This, however, has a ready market with the steel companies who cannot use the galvanized product. It brings only junk prices. During the scarcity of steel, however, we sold some carloads at much better than junk prices, to be used in making automobile grease-cups.

Analysis Reliable.

"Metal obtained from melting up returned and defective telephone cable is another large scrap item, totaling millions of pounds annually. We reuse it, provided the percentage of antimony does not run too high. When it does, we stamp the pigs to indicate their metallic contents and sell them to firms making electrotype metal and low grade babbitts. Since they can rely absolutely on our analysis, they buy these pigs at about the same price we could get for them if the various metals were separated.

"What may strike some of you as a queer product for Hawthorne is cork shavings. These are produced in large quantities in making the cork driving rolls used in machine switching apparatus. We get a nice bit of cold cash from our cork by selling it to refrigerator manufacturers to be used in the refrigerator walls as a heat insulator.

"Another of our by-products is that unfortunate alloy that lost its name in the great war. Officially it is now 'nickel-silver,' an alloy of copper, nickel and zink, very desirable for electrical contact springs on account of its resilience and non-corrosiveness. A while since we had on hand a large quantity of strips about an inch and a half wide and six feet long, which had become obsolete due to a re-design of the apparatus which formerly used it. Our inspection people exhausted their ingenuity and their Bertillon measurements trying to find some place else where it could be utilized, but finally they were compelled to let it go into the scrap. It was too good for junk, so our special sales departments set out to find a market for it and finally sold most of it to novelty jewelry companies and fountain pen companies in Chicago, Kansas City and the New England states at double the price it would have brought as junk.

"You have doubtless heard of how carefully the government cleans the floors and walls of its mint to recover the gold dust that settles there. It is easy to see how that procedure can prove profitable, but for years it never occurred to anyone that Hawthorne had a gold dust of its own—not dust from gold but dust that could be exchanged for gold. This was the dirty looking abraded dust drawn away from our buffing and polishing machines by the blowers. We used to throw it away, but nowadays we sell it for real money.

"Another thing that for a long time didn't seem to be worth saving was the thread remaining on the paper cops removed from our insulating machines. A few layers of tangled thread more or less did not seem to be worth bothering with. However, a study of the subject showed that this waste thread was worth collecting. Now we salvage the thread, selling the silk floss and the worsted yarn outside and using the cotton as waste in our own shops.

"I might go on almost indefinitely detailing Hawthorne's by-products and how we find markets for them. Impregnating compound iron returned loading coil, for example, is an asphaltum compound and therefore salable to companies who waterproof roofs. Our plating anodes are sold to small electroplating firms, who can use them after they are too small for use in our big tanks. We sell old storage battery, plates to manufacturers of antimonial lead products. The paper cops (heavy tubes) on which our insulating yarns are wound find a ready market with manufacturers of fireworks. Old paraffine, badly contaminated with dust and other foreign matter, sells to makers of lithographers' crayons."

Higher Rates Allowed for Resort Business in Wisconsin.

Oshkosh, Wis.—An increase of seasonal rates for summer resorts from $10 to $15 per subscriber for service from May 1 to November 1, has been allowed the Winnebago County Telephone company by the Wisconsin Railroad commission.

English Phone Expert to Visit the United States.

London, Eng.—W. W. Cook, expert assessor of the British government telephone investigating committee, is to visit the United States, Canada, Sweden. Norway, and Denmark.

TOLL DRIVE.

Southern Bell Interests Hard After More Business Thru Teamwork.

Atlanta, Ga.—Southern Bell and Cumberland companies are in the midst of one of the keenest toll business development drives in the history of the business.

To show how all factors in the service are doing their part, and to promote individual effort, the company gives a record of the results of the 100% campaign.

Under the heading, "What are you doing to increase toll business", the following data is given:

"TRAFFIC is now completing 86% of all calls; last year they were completing 83%.

"PLANT is now clearing troubles in 5 hours, while last year it took 5½ hours. Troubles are now 1¾ per month per 100 miles of wire; they were 2.

"COMMERCIAL is showing our customers how long distance service will reduce their costs and increase their business.

"PUBLICITY is effectively presenting the value and economy of long distance service through newspaper advertising and other methods of publicity.

"PLANT has provided more circuits and greatly improved those we had.

"TRAFFIC is now putting through calls in less than 8 minutes, where it used to take more than 11 minutes.

"COMMERCIAL is bringing to the homes knowledge of the social usage of the long distance telephone and a clearer understanding of the various classes of toll service.

"ENGINEERING is improving transmission and introducing the best developments of the art.

"ACCOUNTING is devising helpful records to keep us all informed of what we really are doing to increase the toll business."

Bell Buys and Merges at Galena, Ill.

Galena, Ill.—The Pitcher Telephone company has been purchased by the Illinois Bell Telephone company. The two systems will be consolidated.

New Castle, Pa., Has Bond Issue of $32,000 for New Work.

New Castle, Pa. — City Telephone company has approved another bond issue of $32,000. Proceeds are to be used for extending the company's lines and buying new equipment.

WESTERN REPRESENTATIVE WANTED.

Competent commercial telephone man wanted to represent manufacturers' complete line of exchange telephone apparatus, magneto and common battery, and interior or apartment house systems, and complete line of radio accessories.

Must be well acquainted west of the Mississippi and able to efficiently care for general office to be located in that territory. Correspondence treated confidential.

Give full particulars, experience, references, and salary required.

FEDERAL TELEPHONE & TELEGRAPH CO.
BUFFALO, N. Y.

HELP! HELP!

Still the cry for back copies of TELEPHONE ENGINEER continues, and we are out of the issues in greatest demand.

Requests from Switzerland, England, Australia and Japan are piled up along with those from telephone companies in the United States.

So, good friends, if you will look through your back issues of TELEPHONE ENGINEER and send us the copies of the issues of

October, 1920
March, 1921
April, 1921
June, 1921

we will be eternally grateful. As an expression of our thanks we will extend subscriptions two months for each copy of these back issues received.

We hate to delay in filling these requests for back issues, but at that, it's gratifying to know that they were so good telephone men all over the world just have to get them.

Thanks for your helping hand.

TELEPHONE ENGINEER
Steger Bldg. Chicago, Ill.

POSITION WANTED—As manager of telephone company, operating 1,000 to 2,000 stations, by all-around telephone man, employed at present and for past five years as assistant general manager. Available about November 1st. Address: "W. E. P." c/o TELEPHONE ENGINEER, 28 E. Jackson Blvd., Chicago.

Middletown, O. Puts $150,000 in New Construction.

Middletown, O. — Approximately $150,000 is to be spent within the next few months by the Middletown Telephone company in line and exchange enlargements. Work will be completed within a few weeks according to Local Manager Thompson.

$1,000,000 MERGER.

Cumberland, C. & P., Bristol and East Tennessee Companies Figure in Deal.

Nashville, Tenn.—Permission has been granted by the State Railroad and Public Utilities commission for a million dollar merger of telephone properties in this state. The $1,000,000 is the capitalization of the combination. Organization of the new company is to be effected through the merger of all physical properties of the East Tennessee Telephone company, the Bristol Telephone company, together with the specifically described properties of the Cumberland Telephone company and the Chesapeake & Potomac Telephone company of Virginia.

Approval of the proposed merger must also be obtained from proper federal authorities and the Virginia commission, and it is understood that steps have been taken to obtain the necessary additional approval.

In a statement issued by J. H. Corbitt, secretary of the Utilities Commission, he said that inasmuch as the question of inadequate telephone service has been under investigation for some time and the commission being of the opinion that the formation of the new company and merger of properties with others is to the best interest and advantage of the communities to be served, that the petition was granted.

McCord Rises a Rung in the New York Ladder.

Passaic, N. J.—C. F. McCord, local commercial manager for the New York Telephone company in this city since 1910, has been advanced to the position of Division Commercial Representative, supervising toll development, with headquarters at Newark. McCord has been prominently identified with the civic and social life of Passaic, and has figured prominently in advancing his company's interests in this territory, according to local newspapers.

Illinois State Telephone Convention at Springfield November 8-10.

Jay G. Mitchell, secretary-treasurer, announces that the state convention of the Illinois Independent Telephone Association will be held at the Leland Hotel, Springfield, Ill., November 8-10. Write the hotel to-day and make your reservations, as this convention promises to be very enjoyable and profitable.

ILLINOIS BUSY.

Independent State Association Bulletins Snappy Sessions.

Springfield, Ill.—Illinois Independent Telephone Association is losing no chances to make itself profitable to its members. A recent bulletin, which is significant of the work and plans of the group, says:

"A very profitable district meeting was held at Peoria on August 10th, and those companies in northern Illinois that failed to have a delegate present were losers. A discussion of general publicity methods developed, and practicable, workable, inexpensive plans were described such as every telephone company can easily place in operation. One delegate described an essay contest which eliminated public hostility, attracted attention to the telephone industry, and cost less than $75.00. Such a contest is within the reach of every telephone company, large and small.

* * *

"A district meeting will be held at Bloomington on September 7th, and all telephone companies are requested to send delegates and to watch the telephone papers for additional announcements in regard to it. A discussion of the new Illinois Commerce Commission law will be conducted by an authority on the subject. Other interesting and valuable features will be provided, including an operators' school.

* * *

"The convention of the State Association will be held at Springfield at the Leland Hotel on November 8th, 9th and 10th. Every interest identified with the business is striving to make the State convention a valuable and interesting one.

* * *

"Hon. Frank L. Smith, Chairman of the Illinois Commerce Commission, in the hearing of an important case the first week in August made the following statement of policy which he said the Commission intends to follow:

"The chair is constrained to make a few observations.

"We do not want to try any of these cases in the newspapers. There has been reference made to the attitude of this Commission on rates—relative to their reduction. We are letting the work of the Commission speak for itself. We are going to base our judgment upon the facts. "Those who come before the Commission may expect to get our honest judgment. *They must expect to present their cases with the best ability and all the evidence possible—both sides.*

"We will not render opinions as a matter of party policy. We will not refrain from rendering opinions, however, when in the judgment of this Commission they should be rendered for any cause whatsoever.

"This is the last statement we are going to make about rate making by this Commission."

This is submitted to the telephone companies of the State as outlining the announced policy of the present Commission."

Geo. Partridge, New United Mgr. at Beloit, Kan.

Beloit, Kan.—Geo. H. Partridge is to return here September first as manager of the United Telephone company. He was formerly wire chief here and voted by all a "regular feller." Edward T. Jones, whose place Mr. Partridge takes, has resigned to enter the traffic department of the Pacific Coast Telephone company at San Diego, Cal. The way local newspapers write of these two telephone men, in recording their changes, shows that telephone men are among the leading lights of this thriving spot.

68 N. Y. Telephone Companies Report Big May Increase.

New York City.—Reports on May business of 68 New York telephone companies, just made public show the operating income amounted to $9,767,968, an increase of $2,893,489, compared with the same month in 1920, according to a report issued yesterday. The May operating revenue was $45,342,395, compared with $40,769,671 in 1920 while the net after expenses is shown at $13,123,892, an increase of more than $3,000,000 over the figures for the previous year.

Monroe, La. All "Het Up" With Phone Extension in Sight.

Monroe, La.—Visits of construction experts of the Cumberland Telephone and Telegraph company for the purpose of detailing a vigorous campaign for the extension of telephone facilities in this city, have created considerable comment and enthusiasm in the local press.

New York State Phone Survey Would Cost $2,000,000.

Syracuse, N. Y.—According to Corporation Counsel E. H. Lewis, the city of Syracuse would have to spend $2,000,000 or more if it made the state wide survey of New York Telephone company properties, in securing data for its rate argument.

Wood Preservers Organize A Service Bureau.

Chicago, Ill.—A Service Bureau of the American Wood Preservers' Association has been organized with headquarters in the Otis Bldg., Chicago. P. R. Hicks is secretary-manager. Purpose of the organization is to promote the use of properly treated wood and to act as a clearing house for information relative to all phases of wood preserving work.

Tidewater Company Has Annual Election of Officers.

Gloucester, Va.—Stockholders of the Tidewater Telephone company have elected directors as follows: S. G. Miller, J. M. Lewis, H. E. Hutcheson, W. E. Corr, T. E. Duval, I. K. Weaver, J. L. Farinholt, A. L. Withers and Mrs. W. D. Dimmock. The directors elected J. M. Lewis president and H. E. Hutcheson secretary and treasurer.

Johnstown, Pa. Builds New Home for Two Departments.

Johnstown, Pa.—Installation and construction departments of the Johnstown Telephone company will be housed in a beautiful new building now being erected. Other construction work is planned by general manager E. D. Schade.

Chesapeake and Potomac To Make Improvements.

Wheeling, W. Va.—Wheeling, Clarksburg, Charleston, and other West Virginia cities are to benefit from an extensive campaign of building planned by the Chesapeake and Potomac Telephone company. Among the work will be a 24 mile line between Wheeling and Stuebenville, and a new switchboard at Clarksburg.

Linemen Jerk Iron Markers from Road Posts.

Peoria, Ill.—A roadside advertising campaign has gone kerplunk. Iron trail markers, bearing advertising matter, are being removed from the telephone poles between Peoria and Kickapoo. Buyers of the space had been warned these signs were contrary to public utility commission rulings. Now the advertisers are seeking the men who sold them the space.

Bringing Plant Up-to-Date At New Castle, Pa.

New Castle, Pa.—Extensive improvements are being made in the plant of the Mercer County division of the Penn Telephone company, a recently acquired exchange in the Penn group.

Who Are "Public Relations"?

Maine Telephone Chief Tells How to Promote Family Idea By Making Friends of Customers—A Boy's Definition of "Public Relations" Guides

By M. P. Abbott

General Manager Maine Telephone and Telegraph company

The small boy who defined public relations as your uncles and your cousins and your aunts was not far from right. If he had enlarged his vision just a trifle and included the whole family, the wisdom of his conclusions would not have been doubted by any employee of a telephone company.

In any town of ten thousand people there are perhaps one thousand actual telephone subscribers. If each subscriber's family numbered five persons, we would naturally expect five thousand legitimate users of the telephone service. This leaves five thousand inhabitants of the town in question without telephone facilities other than the public telephone stations. The public stations are available to but a small proportion of this class in any community. Do not think for a moment that this half of the population go without telephone service. They are constant and persistent beneficiaries of the telephone company via their neighbors' back door. In fact they are more critical of the quality of the service than the regular subscriber who has, in some measure, been initiated into the mysteries of telephone faults and troubles.

Educating Non-Subscribers.

In any study, then, of the subject of public relations we must realize that we are dealing with the community as a whole. I sometimes think that we, as telephone managers, make the mistake of thinking the actual subscriber the only party to be considered in the transaction, feeling that if we satisfy him our whole duty to the public is accomplished. The figures indicate, however, that our duty to the Company which we represent and the public whom we serve is only half performed if we neglect the opportunities offered to educate the non-subscriber in the proper use and value of telephone service and on every possible occasion explain the intricacies of the system and the constant vigilance required to produce the service which he may perhaps personally require.

Corporate relations with the community served are either good or bad, satisfactory or unsatisfactory. The good will of the community served is the greatest asset a public utility corporation can have. If the good opinion of those with whom we are doing business can be secured and held during adverse and trying conditions, we have laid the foundations of a successful business enterprise. If our method of doing business, on the other hand, has aroused the enmity and antagonism of the community, if the public has lost confidence in our ability to furnish a telephone service satisfactory to present needs and future requirements, if the feeling exists in the public mind that as individuals they can do a better job than the officials and employees of the Company, then indeed have we failed to measure up to present day opportunities and have laid the foundation for dismal failure.

Cause of Friction.

Friction and misunderstanding may develop from any one of four causes. These, in the order of importance, are: Service, methods, rates, ability to provide facilities for new business. We must all admit that good allround telephone service is the desideratum; it is what the public wants, it is what we advertise to furnish, and it is what we want to furnish. If by reason of faulty equipment, poorly constructed lines, slack attention to details of repair requirements, inadequate or slovenly operating practices, the service has fallen under the condemnation of the subscriber, then indeed, we have failed to capitalize our strongest asset.

To gain the confidence and support of the public quick, accurate, unfailing, courteous service is essential. No one employee of a telephone company can do the trick alone. It requires the consolidated effort of many employees working toward the common goal. It requires team work. It requires cooperation. It requires the spirit of sacrifice and endeavor.

Our business is different from any other in the land. It is more complicated. It is more sensitive, and the resultant service is the combined efforts of many minds working along different channels to a common end. Telephone service depends much upon the individual employee, upon the energy and enthusiasm with which the daily routine is performed, upon the spirit of service as manifested and sustained from day to day.

Public relations are largely influenced by methods of business. In this respect smaller companies have the advantage over larger corporations. With the smaller proposition it is largely a matter of personal explanation, but with the latter it is a more cumbersome system with standardization of methods dependent upon a number of employees for proper execution. This offers more occasion for misunderstanding.

Courtesy An Asset.

The applicant for service must, first of all, have courteous attention. If delay is to result in establishing the required service, the applicant should be fully informed as to reasons for such delay and no promise should be made that cannot be fulfilled.

After telephone has been installed in subscriber's premises, it is the duty of the company to furnish service as advertised. Conceding that this has been accomplished, the next important step is to collect pay for service rendered. The system adopted must of necessity depend upon the size of the company—the larger the company, the more drastic the system and consequently the more likely to disturb public relations in so far as the individual subscriber is concerned. The average subscriber expects to pay for telephone service, but if for any reason there is failure to pay, and subscriber is denied service in order to hasten payment, there is likely to come about a feeling of resentment that may linger for months and years to come. Recognize the fact that the Telephone Company must collect

promptly all sums due in order to conduct a business satisfactory to the public and the stockholder; recognize the fact that denial of service is the argument most productive of results in the collection of delinquent accounts; we must also recognize the further fact that we are dealing with a sensitive human being and that the enforcement of rules and regulations must be exercised with discretion and tact. In the matter of collections, I believe that explanations of company methods and practices in advance of application, most desirable and usually effective.

The establishment of just exchange service and toll rates for telephone service is a matter which often adversely affects public relations. The average subscriber must be convinced that the rate is the lowest consistent with good service. Above all else he wishes good service and is willing to pay what it is worth. I think I am safe in saying that none of the companies represented here are endeavoring to profiteer at the expense of the public. Increased operating, construction, and maintenance costs have necessitated schedules of increased rates, but in no case have these added charges kept pace with actual costs or in proportion to increases in other lines of industry. You will agree, I think, when I say that the telephone companies in the State of Maine for the past five years have found it increasingly difficult to pay fixed charges. Very often the dividend to stockholders has been sacrificed in order to maintain serviceable plant conditions, or, on the other hand, plant has been neglected in order to pay the stockholder a very modest return on his investment. This condition cannot continue long without serious injury to the telephone industry as a whole. It is an unnatural condition and the sooner remedied the better for the public whom we serve. The logical answer, the only possible remedy for present unsatisfactory conditions is more revenue to be derived either from increased exchange service or toll rates, or both.

It is my opinion that when an exchange service rate is admitted to be much below the average charged for similar service elsewhere, then the rate should be adjusted to meet the requirements. If this proves inadequate, then toll rates must also receive attention. In the past it has been difficult to adjust rates without offence to the public. Present methods which require submission of rates to the regulatory Public Utilities Commission before putting into effect gives an opportunity for discussion and education of the public which must not be neglected. The sanction of the Commission is the most convincing argument to the telephone patrons of the justness of, and necessity for, the charge.

Our Facility Problem.

Contentment on the part of the public cannot be secured unless adequate facilities are provided for new business. With proper rate established it is comparatively easy to provide service to the applicant who lives within a reasonable distance from the exchange center. It is the man further out who must receive our attention. At this particular time there is more call for service from the outskirts of the exchange district than from within. Very often the company cannot afford to build the distance required, knowing that the return will be entirely inadequate to pay interest and depreciation charges.

Any telephone company facing the possibility of many installations of this character would throw up the sponge and retire to take up some more peaceful calling. These situations are common to all the companies and the correct solution of the problem is necessary if continuance in business is essential to the future welfare of the company or the public. Each case of this description is essentially different, as to cost, as to necessity, as to character of construction, as to its effect on the public.

It is my thought that the management of each company here represented must work out the problem insofar as it affects territory served by it. No hard and fast rule can be made that would be applicable in all cases. These people want service and are going to have it. If the existing telephone companies do not do the job, some other agency will be found competent to solve the problem. The extreme case does not come often and I am of the opinion that it is better to concede much, better to meet the prospective patron more than half way, rather than by stubborn refusal, offend, without settlement of the controversy. In these cases the last resort is the Public Utilities Commission. Is it not better to gain the good will of the subscriber by solving the problem ourselves rather than effect a compromise at the termination of a long drawn out hearing following the orders of a Commission?

Value of Showing Our Work.

There is opportunity for friction between the Company and the public in the matter of tree trimming, location of pole lines and the moving of buildings through streets and highways. We will assume that the personality and tact of the employee has overcome these difficulties without serious friction. We will assume that service has been established; that rates and practices have been explained to the subscriber; and insofar as can be determined by the managers, standard telephone service is being furnished. What then? What is the next step in the program? I submit, gentlemen, that we must now consider the most important detail making for satisfactory public relations.

Good telephone service must be maintained, that goes without saying; but more than that the public must be informed in detail of the difficulty of the problem. The average subscriber knows nothing of the intricacy of the telephone business. If his service is interrupted, he naturally blames it on the specific telephone in use or on the operator handling the connection. These two items are all he knows about the business; either the company has installed a bum instrument in his house or the operator is not onto her job. He knows nothing of intermediary apparatus. Protectors, loops, cable, heat coils, line wire, switchboard jacks, drops, cords, plugs, all these mean nothing to the average subscriber. He knows only that he wanted to talk at a certain hour of the day and through some fault of the company his service was interrupted. In the larger companies the commercial department is in constant touch with these conditions and usually explanatory information is all that is needed to pacify the subscriber. In the smaller companies no such department is maintained. It comes right down to the individual employee. He or she must be competent to do the job, and it is a big job, for it is continuous. Interference with telephone service comes day, night and Sunday, at the most unheard of hours and in a thousand different ways and if the public is kept in a satisfied condition of mind it is because the individual employee is capable, not only of correcting the trouble promptly, but also of keeping the subscriber informed as to the cause

and the probable duration of interrupted service, and of the persistent efforts the company is making to apply the proper remedy. The employee who can by discretion, tact, and personality, satisfy the subscriber of the good intentions of the company, has accomplished much towards the promotion of ideal public relations. Publicity is what we want. The personal touch is what we want. The employee competent to state facts after investigation is what we want.

Propaganda is a much abused word. The German nation ruined its character, but it is still on the job. There are two kinds of propaganda, the German article and the truthful variety. We want truth, knowledge, information, persistently delivered up to the public by every conceivable agency at our command and on every possible occasion.

The lecture bureau, the press, the cartoon, these have their proper function and are essential in the dissemination of facts the public should be made to understand; but more effective than all these put together is the personality of the individual employee working with loyalty and enthusiasm to overcome the prejudice and enlighten the understanding of the public as a whole.

Skinderviken, In Italy Sends Reports of Good Business.

Chicago, Ill.—J. Skinderviken, the telephone inventor, writes TELEPHONE ENGINEER from Turin, Italy, where he tarried on his European trip, the Skinderviken button is making a big hit with European telephone companies. He says, "My button is getting in everywhere, and in a year from now will be in use all over the world. Country after country over here appreciate 60% battery saving. I am at present keeping a London factory busy and am starting the manufacture in France and Italy. From Turin I am going to Rome, thence home through the central countries and Germany.

Los Angeles Considers New Buildings—Buying Site.

Los Angeles, Cal. — The Southern California Telephone company has applied to the Railroad commission for permission to buy a site for a garage. Other sites for buildings are under consideration. Addition of 12,00 new subscribers in the last six months has forced expansion in the company's facilities.

INDIANA PROGRAM.

Hoosier Second Annual Meeting To Be Featured By Live Subjects.

Indianapolis, Ind.—Program for the second annual convention of the Indiana Telephone association promises a great convention here at the Hotel Severin, September 13 and 14.

The program follows:

Tuesday, September 13, 1921.

Morning.

Registration, 12th Floor, Hotel Severin.
Visit Exhibits and get ready for Convention.
Call to Order, Convention Hall, 13th Floor.
Address of Welcome—Hon. Warren T. McCray, Governor of Indiana.
Response—Hon. Henry A. Barnhart, President, Indiana Telephone Association, Rochester.
Government—Hon. Geo. M. Barnard, Commissioner, Public Service Commission, Indianapolis.
Reading of Minutes of Previous Meeting.
Reports of Officers.
Appointment of Nominating, Auditing and Other Committees.
Luncheon—Severin Rainbow Room.

Afternoon.

Call to Order, Convention Hall.
Address—F. B. MacKinnon, President, U. S. Independent Telephone Association, Chicago.
Address—J. G. Brown, President, Indiana Federation Farmers Associations, Indianapolis.
Report of Activities and Addresses by Dist. Assns.
History of Northern Indiana Telephone Association—F. V. Newman, President, Northern Indiana Telephone Association, Laporte.
History and Workings of Benton Telephone Association—L. W. Conarroe, President, Prairie Telephone Company, Brookston.
Lest We Forget—W. L. Bott, President, Jasper County Telephone Company, Rensselaer.
Depreciation—A. L. Stauderman, Secy. and Eng., Citizens Independent Telephone Co., Terre Haute.
Public Relations—S. M. Isom, President, Southern Indiana Telephone Association, Mitchell.
Future of Telephone Business—L. C. Griffitts, Sec. and Treas. Southern Indiana Telephone Association, Seymour.

Evening.

Dinner—Severin Roof Garden.

Wednesday, September 14, 1921.

Morning.

Call to Order, Convention Hall.
Taxation of Public Utilities—Nelson K. Todd, Tax Expert, Indiana State Board Tax Commissioners, Indianapolis.
Election of Directors for Ensuing Year.
Reports of Committees.
Luncheon—Severin Rainbow Room.

Afternoon.

Call to Order, Convention Hall.
Address—Lawrence E. Lyons, Director, State Highway Commission, Indianapolis.
Report of Activities and Addresses by District Associations (Continued from Tuesday)—Ex-President, National Independent Tele. Assn., Richmond.
Origin and Development of District, State and National Associations—A. C. Lindemuth.
Problem of High Tension Lines Built Along and Into Telephone Leads by Electric Light and Power Companies—P. J. Maloney, Pres., Northeastern Indiana Telephone Assn., Columbia City.
Address—Frank E. Bohn, Secy., Gen. Mgr., Home Telephone and Telegraph Co., Fort Wayne.

Evening.

Dinner—Severin Roof Garden.
Dancing—Severin Roof, after 9:00 P. M.

California Association Elects New Officers.

Pomona, Cal.—Newly elected officers of the California Independent Telephone association are Charles A. Rolfe, of Redlands, president; Carl H. Lerbeer, of Pomona, vice-president; Carl D. Rolfe, secretary pro-tem.; and T. A. Gould, of Redondo Beach, member of executive committee.

The resignation of the secretary, Ernest Irwin, who expects to become a member of the staff of the railroad commission as assistant engineer in the telephone department, was accepted by the association with regrets.

Chehalis, Wash., Company Works on City Beautiful Plan.

Chehalis, Wash.—Service betterment and public good will have followed in the wake of the $60,000 construction campaign conducted by the Pacific Telephone and Telegraph company in this city. Particular attention was paid to pole line work which was planned in harmony with citizens interested in "city beautiful" activities.